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British Association of Gas Managers.

Wednesday Afternoon, June 10.

Mr. G D. Malam (Halifax) read the following paper on

RETENTION OF NAPHTHALINE IN COAL GAS—AN EFFICACIOUS METHOD FOR DEALING WITH IT.

At our meeting held in this room in the year '68, the late Mr. James Sharp (as many of you will remember(introduced to our notice a paper on the deposit of naphthaline in service-pipes and mains. In that paper he pathetically expressed his inability successfully to cope with the naphthaline nuisance, and stated, moreover, that when he called upon the late Mr. Lowe to supply him with a remedy, this very consolatory statement was launched out at him :

"I wish I could suggest a cure for you ; I should be a very clever fellow to do so. We supply Buckingham Palace through two 4-inch pipes ; one of these is continually becoming choked with napthaline, while the other remains free. I canot tell how it is, it is so arbitrary in its formation."

On the discussion of Mr. Sharp's paper certain suggestions were thrown out, such as prolonging the contact of the gas with the newly precipitating tar and liquor, condensing slowly, and employing large or powerful apparatus for condensation.

I tried these various remedies, and increased the washing power to the extent of 10 gallons and upwards per 1000 cubic feet manufactured; and yet, upon certain conditions of the atmosphere, 20 per cent. of the public lamps would occasionally be returned as deficient from naphthaline, whilst the mains, service-pipes, and meters were continually getting stopped up, creating, as a matter of course, great annoyance, not only to the gas consumers, but to myself also.

The next step I took to solve my difficulties was to run naphtha continuously into the leading mains, but this apparently did little good.

One of the last experiments, however, that I made, and which has been carried on periodically for the past four years, has thoroughly succeeded : and it is this : When the lime and oxide purifiers are being recharged with fresh materials, I have crude or refined naphtha sprinkled over each layer or stratum of lime and oxide, and the result following this practice is that, no matter how much the gas may be impregnated with naphthaline when leaving the scrubbers, it cannot then, after it had passed, as it were through a succession of naphtha gauntlets, retain any of that impurity in it, as proved by the fact that there are now no deposits of naphthaline in the mains, services, lamp-taps, or meters.

The happy result thus obtained at a nominal cost by the use of naphtha prevented a considerable outlay upon extension for washers and other apparatus, the plans for which I had previously had directions to prepare, and which were all finished just at the time I discovered the above mode for getting out of what had been for years a very serious embarassment to the managers of the Halifax Gas Works.

To those who have to plunge the inlets of their gasholders, or are plagued with partial stoppages of the inlets and outlets of their station meters, I recommend my practice to their notice as an infallible remedy for such troublesome occuraences.

Mr. James Watson (Sydenham) read the following paper on

CONDENSATION, AND ITS EFFECTS IN THE RETENTION OF NAPHTHALINE.

I need hardly revert to the fact that condensation in gas manufacture is of the utmost moment to those engaged in this branch of industry, inasmuch as we find that by excessive condensation we can deprive the gas of valuable illuminants necessitating the use of a certain percentage of cannel, to restore to the gas its natural illuminating power ; thus a really earnest desire to secure thorough condensation may result in serious injury to the lighting power of the gas, and be a source of great expense to the manufacturer. On the other hand, deficient or imperfect condensation may give rise to imperfect and expensive purification. What this happy medium is I feel assured that there will be a great diversity of opinion, and the object of this paper is not to show what that happy medium is, but rather to show that naphthaline can and is being deposited in a solid form in the process of condensation used at many works, and that with proper care it can be retained in the gas in the shape of vapor, and delivered at the consumer's burner as a valuable light giving constituent. Naphthaline, in the solid form, is a serious annoyance to consumers, owing to the frequent stoppages in service-pipes, and is likewise a source of serious expense to companies in making up the loss in illuminating power caused by its abstraction, and in clearing out stoppages in mains and services. Condensation begins with the birth of the gas, and ought to end at the inlets of washers or scrubbers, and the process should be slow and gradual that the temperature at those points should be so slow and gradual that the temperature at those points should not be more or less than 60° to 70° Fahr. The terms "slow" and "gradual" may be construed to mean many things, but practically I take them to mean that at no point between the hydraulic main and the inlets of washers and scrubbers should there be a noticeable fall in temperature. Naphthaline is only produced when carbonizing at high temperatures, and is only deposited when the gas is subjected to a sudden fall in temperature between the points already adverted to.

An apparent difficulty may arise in the minds of some engineers and managers as to how to obtain this evenness of temperature during the prevalence of severe frost. This I manage by cutting off such an amount of condensing power as to secure the required result, having thermometers inserted in the mains at (say) 12 or 15 points, so that the required temperature can be worked to within a range of 5° Fah. On the other hand, there is the summer heat to contend with ; and where the condenser or condensing mains are exposed to the sun's action, I paint them pure white, to lessen the absorption of solar heat, and with the most encouraging results. My acquaintance with naphthaline began when I came to the south, 14 years ago ; and, with Newcastle coal and high heats, naphthaline was formed in such abundance that the inlets and outlets of holders became choked up, to say nothing of district mains and services. Being in great difficulty, I laid on steam pipes, and endeavored to dissolve the naphthaline, and pump it up with the condensed steam. This seemed to meet my case, but the ¾-inch suction pipes of the pumps became choked, and were enlarged to 1¼ inch with the same result ; and the continued applications of steam caused the naphthaline to run together, and defied the action of steam, so that I was obliged to take off the man-lids, and resort to plunging the pipes with cold water—a process doubtless well-known to you.

I beg to add here that the application of heat from time to time had the effect of expanding the lead joints of the pipes in the inside of the tank, causing them to leak in water, thus necessitating frequent pumping of the syphons. About this time a new retort-house was built, and the gas had to be conveyed some little distance, to bring it into connexion with the other portions of the works. The pipe was suspended by brackets in the inside and outside of the house. The tar and ammoniacal liquor were allowed to flow with the gas until it arrived at the condenser, and from that day to this I had little or no trouble with naphthaline. The results were so marvellous that in the old retort house of the same works a pipe was hung inside and outside of the house, the tar and ammoniacal liquor flowing with the gas, and with the best results. This system, which has been very generally adopted by engineers and managers, was much sneered at by metropolitan engineers, but those who sneered most were the first to adopt it, and the rest is well known to you. It is not the object of the writer to enter into the chemistry of this matter, he would rather leave that for chemical experts, but would just say that naphthaline should be kept in a state of vapor by evenness of temperature, by being kept in contact with coal tar, until it is condensed by means of a long condensing main. Some five years ago this system was adopted at the Crystal Palace District Gas-Works, and a good sum of money was paid for the information, it being considered quite new at that time. In addition to these long lines of condensing main, what

is termed a battery condenser was erected to take out the remaining naphthaline, the aforesaid condensing main being evidently insufficient in length and power; the results of this battery condenser were that it did not take out the naphthaline, but led to its deposition in larger quantities, to the manifest injury of the gas, leading to the use of 8 to 10 per cent. of cannel. On investigation, I was led to believe that this arose from undue and rapid condensation, and began to decrease it by stopping up the tubes, and eventually, in cold weather, by passing the condenser altogether, and thus suiting the condensation to the make of gas. I have not had one stoppage in the works, nor have I had to remove a man-lid from a holder during the last two years, although these things were quite common previous to my becoming engineer of these works. With reference to the district, with, say, 7,000 consumers, and a make of 300 million per annum, our complaints from this cause average, say, 1 or 2 per day. With reference to the heat in carbonizing, I would just say that we are "paid" for nearly 9,000 cubic feet per ton carbonized, that the consumption of cannel is 2 per cent. only, the illuminating power is 15 candles, taken at a point over two miles from the works, perfect freedom from ammonia and sulphur compounds being under 20 grains per 100 cu. ft., in accordance with the parliamentary obligations of my company. With reference to the deposition of naphthaline, there are certain phenomena which I never could account for. At a village five miles from the point of supply, and with, say, 120 consumers in the village, naphthaline only manifested itself to one consumer, and that was every month or so. The naphthaline in question was always found in the plug of the 1¼-inch main cock, which was simply blown out by the breath, and there was an end of it for a time. I have endeavored to account for it by supposing, as the consumer in question was the largest in the village, the greater draught on his service gave him the benefit of the naphthaline. I have noticed also that coal that has been exposed to the action of the weather yielded naphthaline more readily than coal that was fresh and dry. The richer the coal the less naphthaline appears to be deposited. Thus with cannel gas it is never met with, and in my experience as engineer of the British Gas-Light Company at Hull, in carbonizing upwards of 40,000 tons of Yorkshire coal, I do not remember to have seen a trace of this substance. I do not pretend to account for this; but the facts remain. This substance should not be regarded as an impurity but an illuminant, which ought to go to the consumer's burner; and in view of the increasing scarcity and high price of cannel, we are warranted in using all the means in our power to retain in the gas every portion of its illuminating power.

Dr. Van der Weyde on Ammonia.

The distillation of coal for the production of illuminating gas is such an abundant source of ammonia as to make it an object to collect this substance for economical purposes. It is by the affinity of this body to sulphuric acid that it is collected from the purification water of the gas-works. It is, up to the present time, a very unfortunate fact that considerable quantities of this precious agent are continually lost every day by combustion where they could be saved, especially in closed vessels, where animal and vegetable substances are subjected to distillation. Thus all the industrial works which distil coal in closed vessels for different purposes, as those who manufacture coke, the Siemens furnaces and their equivalents, the high furnaces, etc., should take measures to collect the nitrogen compounds which develop amidst the combustible gases.

The manufacturers of bone-black, and those who calcine bones for divers purposes, and now send up the products of this operation by tall chimneys high in the air, in order not to create a nuisance for reason of the bad odor, should, and could, collect and utilize this most useful nitrogenized material now utterly lost.

If the interested parties realized the correctness of these views, they surely would not let a material of so positively useful application any longer go to waste. Nothing is easier than to construct small, simple contrivances adapted to collect the now lost materials in every case where an ammonia compound is produced.

The sulphate of ammonia is very soluble, very easily assimilated by plants, and is, as commercially found, almost pure. It contains scarcely from three to four per cent. of foreign matter, and the quantity of nitrogen in the same is very nearly 20 per cent.—*Manuf. and Builder.*

Chemical Repertory.

No. 118.—August 17, 1874.

EDITOR—HENRY WURTZ.

CHEMICAL EXCERPTS.

1197. Japanese Coal.—There appears a prospect of good coal being shortly made available for consumption in Japan. The largest of the coalfields of Japan, that of Takosima, has come into possession of the Japanese government, and it is hoped that an increased outlay of capital will produce satisfactory results.—*Jour. Society of Arts.*

1198. Civilization in Barbary.—The city of Tunis was illuminated on Saturday, the 23rd May, with gas for the first time, amid great rejoicings, in presence of the court and the representatives of all the foreign powers.—*Ibid.*

1159. Sausages Colored by Aniline.—Aniline red is used, in Europe at least, to impart to sausages a fresh and healthy appearance. It can easily be detected by the use of alcohol or ether, either of which substances dissolves aniline, but not blood. This use of aniline red is severely reprehensible, not only from the fact that it is known to have caused the illness of entire families who have eaten meat colored with it, but also because, from its mode of preparation, it frequently contains arsenic, and must, therefore, act as a poison.—*Amer. Chemist.*

1200. New Ohio Coals Opened.—A number of capitalists interested in developing the coal and iron fields of Perry and Athens counties met in Columbus June 9, and decided to organize a company to build a railroad from Columbus to a point at or near Sunday creek, in Athens county, and filed a certificate of incorporation.—*Cleveland Leader.*

1201. Ice about Ships.—M. Michel's apparatus indicating automatically the presence of blocks of ice or icebergs about ships. A case suspended from the side of the ship encloses a bimetallic thermometer with a small rod attached to the helix, which moves right or left, according as the temperature rises or falls. When the temperature falls, the rod comes against a small metallic knob, and thus closes a circuit, ringing a bell placed near the officer on watch.

1202. "Cold Pizen."—At a recent meeting of the Academy, H. St. Claire Deville, distinguished French chemist, offered to the gentlemen present a tight vial containing about 15 pounds of osmium, the most deadly poison known. In a short explanation, M. Deville said that 20 pounds of the metal would be sufficient to poison the entire population of the world. One thousandth part of a grain of osmic acid, set free in a volume of air of 100 cubic yards, would possess such a deadly influence that all the persons respiriog this air would be nearly killed. Osmic acid is so much the more dangerous that no counter poison is known against it.

1203. The Mine on Fire at Wilkesbarre.—The miners who have been for the last two months at the Empire mine, near Wilkesbarre have ceased work, having become convinced that their efforts to control the fiery element were becoming more hazardous and unavailing each day. Subsequent events proved that their apprehensions were not unfounded, as a most extensive "cave in" of the mine occurred, exceeding in extent the fall at the Baltimore mine which took place a short time since. Great consternation prevails in the neighborhood of the mine, and and families are preparing to leave the dangerous proximity. The fire now has free scope, and threatens to ruin utterly one of the most valuable possessions of the newly-formed Wilkesbarre and Lehigh Coal Company.—*U. S. R. R. & Mining Register.*

1104. Pure Subchloride of Copper.—The quickest and simplest method, says Bœttger, of preparing cuprous chloride—used as a reagent in gas-analysis—is to make a solution of cupric chloride and add to this a solution of stannous chloride. The two substances react upon each other to produce stannic chloride and cuprous chloride; the latter soon settles, and requires only to be washed on a filter to obtain it pure. Another method, previously discovered by the same author, consists in acting upon finely pulverized hammer-slag, or copper ash—which is a mixture of metallic copper with cuprous and cupric oxide—with concentrated hydrochloric acid in a closed flask with occasional violent shaking. On turning out the solution in pure water, the insoluble cuprous chloride separates as a white powder.

1205. Working Coal in Depth.—The *Ironmonegr* says: It has been stated that it is not likely coal can be worked below 4,000 feet in depth; but in the neighborhood of Charleroi, in Belgium, coal is worked without any difficulty at nearly 4,000 feet. In reference to the hindrance expected to arise from increase of heat, Mr. Hunt states that his measurements of temperature have tended to show that the rate of increase diminishes; down to 100 fathoms from the surface he has found the increase one degree in 50 feet, but in the next 100 fathoms only one degree in 70 feet, and in the third hundred one degree in 85 feet. Even supposing the heat to be as great as some people imagine, he believes that very heat will be found to be an engineering agent which will assist in the processes o ventilation, so as to produce a temperature sufficiently low to enable men to work there with no great difficulty.

1206. Sulphur in Sicily.—Yccording to a report addressed by Signor Parodi to the Italian government, it is estimated that ihe sulphur in Sicily will be exhausted in from 50 to 60 years. There are about 250 sulphur mines in the island, producing about 1,800,000 quintals yearly, beside the enormous quantity which is lost through defective methods of working. In 1871, 1,725,000 quintals were exported, of which England took from 500,000 to 600,000, and France about 400,000 quintals. The ore contains from 45 to 40 per cent. of pure sulphur, but the average amount extracted is only 14 per cent.

[Since the above appeared, strong doubt has been thrown upon this estimate, from another source, the attainable quantity being claimed to be immensely larger than this.—Ed.]

1207. Bending Glass Tubes.—Those who are familiar with the arts and their history, must be struck with the frequency with which old devices are brought forward and announced as novelties, and this too by our most enterprising and ably conducted journals. Looking over a recent number of the New York *Tribune*, in the column announcing new industrial discoveries and inventions, we find that fully half the items are descriptions of devices which are so old that it would be difficult to tell when they were first introduced. Thus the first paragraph tells us that in order to make a perfect bend in lead and copper tubes cold, and in glass tubes when softened by heat, it is well to fill them with fine dry sand! We would like to see a work on glass blowing so old that it does not contain this.—*Prof. John Phin in Technologist.*

1208. Cornish Pumping Engines.—The number of pumping-engines reported for Sanuary is 19. They have consumed 2,215 tons of coal, and lifted 15·8 million tons of water 10 fathoms high. The average duty of the whole is, therefore, 47,900,000 lbs., lifted one foot high, by the consumption of 112 lbs. of coal. The following engines have exceeded the average duty:

	Millions.
Cook's Kitchen—50 in	49·7
Crenver and Wheal Abraham—Sturt's 90 in	57·1
Ditto —Pelly's 80 in	57·6
Ditto —Willyam's 70 in	57·3
Dolcouth—85 in	55·4
West Basset—Grenville's 70 in	49·5
Ditto —Thomas's 60 in	54·3
West Chiverton—New 80 in	50·1

West Tolgus—Richard's 70 in.....54·5
West Wheal Seton—Harvey's 85 in.....53·7
—*London Mining Journal.*

1209. A British Gas-Squabble.—The London *Journal of Gas Lighting* informs us that the Exeter Town Council and the gas company have just now a difference which, they are happy to think, will be amicably settled. The company have recently laid a new main up one side of the High Street, to replace another which ran up the middle of the street. They now propose to remove the old main; but the council object to the disturbance of the roadway, which the surveyor asserts could not, if broken up, be brought again into its present excellent condition for many years. The objection is reasonable; but the company want the pipes, and, as they properly say, cannot forego their legal right to remove them. A very simple course has been suggested to the council, which we hope they will adopt. They can buy the pipes of the gas company and leave them as they lie, where, though empty of gas, they will serve a very useful purpose.

1210. Alcoholic Fermentation.—Oscar Brefeld.—The author concludes that—(1) Alcohol yeast, like all other plants, requires for its development and increase the co-operation of free oxygen. (2) If air and free oxygen are excluded, the yeast cannot grow. These two facts overturn the theories of Pasteur on fermentation. (3) Yeast, in contradistinction to all other plants, when in solutions where its growth is possible, has a great affinity for free oxygen. It can completely extract free oxygen mixed with 6000 volumes of carbonic acid. (4) *Mucor racemosus* has the same property, and excites alcoholic fermentation in a saccharine solution. (5) Growth and increase of yeast may take place without fermentation, and again, fermentation without growth of yeast. The carbonic acid thrown off in fermentation is remarkable for its purity. (8) In suitable solutions, exposed to the air, growth of the yeast plant and fermentation occur simultaneously in different parts of the liquid. (7) Fermentation is the expression of an abnormal incomplete vital process, in which all the bodies required for the nutrition of the yeast do not simultaneously and harmoniously co-operate. These results will prove of great technological interest.

[Communicated by the Author.]

Lighting and Extinguishing Gas Lamps in the Streets of Cities by Electric Agency.

[Concluded from page 46.]

Ever since the introduction of gas to illuminate the streets of cities, these problems have constantly presented themselves: How can the street lamps be most quickly, conveniently, and economically lighted? or how can the slow, unsatisfactory, and expensive method that is still everywhere in use, of employing men to run from lamp to lamp (albeit with the proverbial celerity of lamp-lighters) for the purpose of igniting the gas, be best superseded? How can the authorities of a city absolutely control the lighting of its streets, profiting when possible by the radiance of the "Queen of Night," and always giving the light they are charged to dispense at the proper time, and not, as at present they are compelled to do, an hour before or after it is required? And, now, it may be inquired—Why has not the electric method of igniting gas, which has been proved so safe, successful, and desirable in buildings, been applied to inflame the gas in street lamps, and bring a whole city in a minute from darkness to light? Would this not be simply an extension, with immense saving and comfort to our citizens, of the same plan as now adopted in buildings? Is not the electric fluid, which has swept from San Francisco to Boston and back, more than 7,000 miles in less than a second, working a dozen repeaters on the way, or which is rushing every instant from continent to continent beneath the broad Atlantic, capable of such extended application—capable of lighting in one minute the 23,000 street lamps of New York city?

In answer to these questions it may be said that ingenious men of various nations have, for more than thirty years, been striving to effect this apparently simple extension of the application of the long known fact, that gas can be ignited by electricity.

To accomplish the proposed object requires an extensive survey and critical study of the whole field of electricity and magnetism, an investigation of mechanics, and the physics and chemistry of many liquid and gaseous bodies, the construction of telegraph lines, insulating materials, and the causes of their deterioration, together with many other subjects. The records of our own and foreign Patent Offices show how diligently inventors have pursued this inquiry, and endeavored, heretofore unsuccessfully, to surmount the *practical difficulties* that environ the object sought.

The first recorded suggestion to light street lamps by electricity seems to have been made by Mr. Joseph Beck, of England, in 1839. He described and figured in one of the magazines of the day an ingeniops, though really for the purpose intended impracticable, apparatus consisting essentially of a hollow glass ball-valve resting in a conical seat at each street lamp, and insulated wires connecting together the various burners. The valves were to be raised to admit the gas, by increasing the pressure of the gas itself at the lamps, and in order to do this an independent line of pipes was required. The lighting was to be effected simultaneously at all the lamps, by sparks from a high-tension electric current sent over the line from a station. He recommended to bury the wires connecting the lamps, and to insulate them from the ground by glass tubes. This plan, it will be observed, only proposed electricity as an agent to *light* the gas, and *not* as a means also to actuate the valve that admitted and excluded the gas. There is nothing to indicate that any attempt was ever made to test this invention practically.

An apparatus invented by Prof. Klinkerfues, of Gottingen, Prussia, in which the gas was admitted and shut off by a similar power to that employed by Mr. Beck, though the valve was different, and the igniting of the gas was effected by a platina wire heated by a small galvanic battery *at each lamp*, was tried in the year 1872, on a section of lamps in a street of Gottingen, and it is reported with good success.

The earliest apparatus described for operating the valves, as well as igniting the gas, of a series of street lamps by electric agency, is that of Charles Cowper, who took out a patent for the same in England in the year 1856. Cowper's invention was novel, being entirely different from anything before proposed, but for want of due elaboration of details, not to speak of a defect in principle revealed to science by actual experiments on a large scale since that period, it could not have succeeded had it been put on trial. In this apparatus—the first by which it was proposed to *light* and *extinguish* the gas by *electric* agency—the attractive power of electro magnetism kept the valves closed during the day, and the force of a spring opened them at night when the battery current was arrested. A small induction coil was at each lamp, and the sudden cessation of the battery current throughout the whole line was intended to cause the induction necessary for giving an igniting spark.

Since the inventions of these pioneers in the art, many other inventors, mostly ignorant of what had already been done in the same field, have produced apparatus generally exceedingly ingenious, but always having some fatal defect. Besides the pressure of the gas, electricity and magnetism, compressed air, and clock-work machinery moved by the tension of a spring, have been used to furnish the motive power to operate the valves of street lamps; whilst electricity, produced in every known way offering the least prospect of success, and chemical substances, like spongy platinum, and compounds inflammable by friction, have been invoked to effect the ignition of the gas.

The lighting of street lamps by electricity is quite a different matter from lighting the gas jets in a building by that means. In the latter case the burners are near together, and all communicate with one gas pipe, into which the gas can be admitted, or its flow shut off, by one stop-cock conveniently placed near the hand of the person who directs the electric currents. In the former case the lamps are widely separated from one another, twenty-eight or thirty usually extending a mile, and all are in direct communication with the street main; that is the great gas pipe that supplies the houses along the route, which main is always full of gas that is prevented from escaping at the lamp posts by a small stop-cock at each burner; hence, it is apparent, that there is no way of controlling the flow of gas at the different street lamps by means of one valve operated at some central station, but that the control must be effected, as at present, by a device at each burner. In the one case there is but a single difficulty to be surmounted, namely, to ignite the gas. In the other case the gas must first be let on by electric agency at the burner of each lamp of a long series, then ignited, and, finally, shut off at each burner by the same agency when desired; and all must be done by apparatus that is simple, neat, certain in action, durable, and comparatively inexpensive.

On close examination it is found that the power at command to move the valve at each electro gas-lamp is very feeble, and is practically limited; that a lamp valve is needed, easy to move, perfectly tight, and that cannot stick from any cause; that simple means are needed by which the electricity shall open the valve of each lamp at the same time, and by one impulse; then keep it open when the current ceases; and then close it, when desired, by one other electric impulse from the distant station; that means are required to light the escaping gas quickly and surely; that a durable, and practically unobjectionable, means of electrically connecting together the various lamps and the stations is needed; that mechanism is required to direct the currents at a station to the different sections of lamps operated from it, and also to throw into action numerous stations from one central station. All of these requirements seem to have been embodied in an apparatus invented by Dr. John Vansant, of San Francisco, Cal., and practically tested in the city of Washington, where an exhibition, on an extended scale, of the successful working of this apparatus was made for one month, commencing on the 16th of December, 1873. Hundreds of people witnessed it with astonishment and delight. On K street, one of the most beautiful thoroughfares of the renovated capital, a long series of lamps extending a mile in a straight line, and all visible from one point, were seen every evening at the appointed time, during the period above mentioned, to flash absolutely instantaneously into light, moved by that mysterious swift-winged messenger electricity, and fired by his torch. At morning the same ethereal agent, with the same amazing rapidity, arrested the subtle gas and extinguished the lights. A like achievement has never before been accomplished in any country. The effect of the lighting was startling at any time, but when the long line suddenly sprang into brightness one evening in the midst of a driving snow storm—the scene was phantom-like and beautiful. The quick darkness that fell upon the eye when, in the early morning, the near and distant lights simultaneously vanished during a hard rain, produced a feeling peculiar and indescribable.

The apparatus by which this success was attained consists, besides the battery, switch, and inductorium, at the station, of an electro-gas lamp within each street lantern, taking the place of the ordinary burner. This lamp contains a valve of mercury contrived so as to permit or arrest the flow of gas, in the simplest and most effectual manner, by the rise and fall of the fluid metal in connection with a movable cap over the end of the inlet gas tube.

The movements are effected by the mutual attraction of two double tubular electro-magnets combined with one contained fixed coil, an arrangement that affords the maximum magnetic power from the current employed. A single electric impulse sent over

the wires opens *instantaneously* the valves of a whole section of lamps, and they are retained open by a gravity catch of simple but peculiar construction when the current ceases, or is shifted to another section of lamps. One other electric impulse sent at will over the line *simultaneously* extinguishes the lights by shutting off the gas at each lamp. The gas is ignited by the passage of an electric current of high tension, sent from the station over the whole section of lamps at once; and this was done on K street through an *aerial* line of *uncovered wire*, composed of thirty independent pieces, whose aggregate lengths made two miles. It could have been equally well effected through an insulated wire buried beneath the street. The inventor of this apparatus has also devised a practical method of instantly lighting and extinguishing the numerous jets, without transmitting from the station any other than a single current of *galvanic* electricity, but this method, for prudential reasons, he does not wish, just at present, to make public.

It would seem certain that, in this age of progress, such a demonstrr tion as has been given in Washington, of a problem hitherto baffling the inventors, and perplexing to gas companies and municipalities, will not long fail to attract the attention it deserves, and secure to the denizens of our cities, at a greatly reduced expenditure, the light which they now pay for, but cannot possibly receive at the desired time.

American Water-Gas Researches.

REPORT OF PROFESSORS SILLIMAN AND WURTZ.

[Concluded from page 65, Vol. 21]

CONSIDERATION OF THE ILLUMINANT CONSTITUENTS.

To these data, before entering upon their discussion, we shall add another short Table, containing, with these, some further direct determinations of the illuminants in the Fair Haven gas, made at other times and under other conditions.

With regard to these results, the most striking general conclusion that forces itself upon our minds is, that no change is wrought in the solvent or sustaining capacity for the illuminant vapors, of a special gaseous substratum (or mixture of permanent non-luminous combustible gases) by the substitution of one of its constituents for another By Table XIV, it appears that the substratum of the Fair Haven gas contains 8 per cent. more carbonic oxide and 11½ per cent. less marsh gas than that of the New Haven gas; and yet about the same proportion of illuminating vapors is retained in the gas during its condensation, in an uncondensable form of combination. Connected intimately with this part of the subject is the consideration of the quantity and quality of the tar condensed from the gas.

THE GAS TAR OF THE HYDROCARBON PROCESS.

The total amount of tar condensed at Fair Haven between the 24th of February and the 27th of March was 270 measured gallons, and the quantity of coal (chiefly Westmoreland, with from 10 to 15 per cent. of albertite) carbonized during the same time was closely 30½ tons, equal to about 9 gallons of tar per ton. The amount of gas produced during the same period was 409,000 cubic feet, or about 13,400 feet per ton.

At the New Haven gas works, similar mixtures of coals have yielded, during the same time, on an average, a little over 11 gallons of tar per ton of coal, the amount of gas produced being about 9,200 feet per ton. It is clear, therefore, that the volume of gas that represents the difference in the product per ton of coal, namely, 4,200 feet, must have taken up into solution not less than two gallons of the more volatile constituents of the tar. That this enormous amount of highly carbonaceous volatile oily matter is held fast by the compound gas with the greatest pertinacity is shown by our observations on the permanency of this gas under the influence of exposure to long-continued and intense cold, which are elsewhere detailed. It is incumbent on us to inquire what is the nature of the substances which are thus retained by the hydrocarbon gas. These must belong chiefly to what are classed as the heavy oils of coal tar, with the addition, doubtless, of naphthaline, a large constituent of that waste product. It appears, therefore, that the tendency of this improvement is to retain in permanent solution in the body of the gas a much larger proportion of those components of coal-tar which are well recognized as having higher equivalents, higher vapor densities, higher illuminant intensities, and in every way higher practical values than the components now made available by the ordinary modes of manufacture. No consideration should more powerfully tend to overcome the prejudices that have unfortunately pervaded the minds of some gas engineers against the hydrocarbon process, than this.

The main components of coal-tar, so far as known at present, that belong to the above class are—

Naphthaline.....C^{20} H^{8}
Xylole.....C^{16} H^{10}
Cumole.....C^{18} H^{12}
Cymole.....C^{2} H^{14}

Phenol and cresol are also present largely in the tar, but as these have been shown to be arrested, according to our previous investigations, by the ordinary lime purifiers, they do not fall under this head. The point that presents itself prominently here is, that an important percentage of the tar, including the above valuable illuminants, is shown incontrovertibly, by the facts here presented, to be made available by the application of this improvement. The substances here mentioned are recognized as those which make up the mass of the heavier oils distilled from coal-tar, known as "dead oils."

THE VITIATION OF AIR BY BURNING GAS.

[A long chapter in the original Report, on the calculation and comparison of the *calorific powers* of these gases is omitted, because its substance has been long since incorporated with a communication by Professors Silliman and Wurtz to the scientific world, which was published by us some four years ago.—EDITOR.]

The appreciation of the objections to the use of gas in close rooms, has led long since to many attempts to introduce into use ventilated burners and similar contrivances; but these prove to be of no general practical value. The question as to the greater or

TABLE XIV.

	New Haven City gas, without air. (From Table XI.)	Fair Haven compound gas, without air, mean of 4 analyses. (From Table X.)	Substratum of New Haven gas, without the Illuminants.	Substratum of F. H. Gas, without the Illuminants.
Hydrogen	43.58	46.77	46.79	50.27
Carbonic oxide	2.14	9.56	2.31	10.27
Marsh Gas	47.42	36.71	50.90	39.46
Illuminants	6·86	6.96	.....	.....
	100.00	100.00	100.00	100.00

TABLE XV.

	Illuminants, in 100 vols.	Coal and other materials used.	Corrected candle power.	Remarks.
Dec. 17, 1868	7.20	Westmoreland, with 5 per cent. rosin	20.03	
Dec. 31, 1868	6.42	" "	.....	Weather had been very cold.
Jan. 6, 1869	7.67	" "	21.08	This gas had stood in the holder at rest for 8 days. Weather milder, and some of the illuminants condensed in December had been again taken up.
Feb. 5, 1869	7.08	Westmoreland, with ten per cent. albertite	20.81	
Feb. 8, 1869	6.83	" "	21.05	
Feb. 9, 1869	6.80	" "	21.18	
Feb. 10, 1869	6.81	" "	20.86	
Averages	6.97		20.83	

TABLE XX.

		Cubic feet produced from 100 cubic feet of New Haven gas.	Cubic feet produced, from 100 cubic feet of Fair Haven gas.
Watery vapor, from the	Hydrogen	43.58	46.77
	Marsh gas	94.84	73.42
	Olefiant	13.72	13.92
Total watery vapor		152 14	134.11
Carbonic acid, from the	Carbonic oxide	2.14	9.56
	Marsh gas	47.42	36.71
	Olefiant	13.72	13.92
Total carbonic acid		63.28	60.19
Oxygen, consumed by the	Hydrogen	21.79	23.38
	Carbonic oxide	1.07	4.78
	Marsh gas	94.84	73.42
	Olefiant	20.58	20.88
Total oxygen consumed		138.18	122.46
Cubic feet of air corresponding		659.73	584.25

less vitiation of the air of an apartment by different kinds of gas is, therefore, not without importance. It seems especially desirable to examine into this point here, because among the popular accusations brought up often against hydrocarbon gas methods are—greater vitiation of air by carbonic acid, by reason of the supposed large percentage of carbonic oxide; inordinate amounts of watery vapor, from the combustion of so much hydrogen; and so on. All these, like many other notions that have prevailed, are shown by our analyses to be wholly chimerical—the difference in every case being in favor of the new process—as will appear from an inspection of Table XX.

DENSITIES.—Very numerous and careful determinations of density have been made by us, both on the water-gas and the perfected hydrocarbon gas. We, however, attach very little importance to specific gravity as an index of the illuminating power of gas, and have therefore not introduced this element, except in a few cases; for example in Table III, on another page in a preceding issue.

REVIEW OF THE PRINCIPAL POINTS ESTABLISHED BY THE PRECEDING RESEARCH.

The evidence set forth in this report sustains the following important conclusions, viz.:—

First.—The production of illuminating gas by the Gwynne-Harris hydrocarbon process, on a large scale, and from materials in common use, is a result already well established.

Second.—The apparatus employed for this process is simple, inexpensive, permanent, little liable to derangement, and easily adapted, at a moderate expense, to all existing gas-works.

Third.—The average yield of gas obtained by this process from ordinary caking coals, with the addition of small percentages (5 to 15) of enriching coals, is 6½ cubic feet per lb., with an average illuminating power of 18 candles; and for a less candle power (say of 15 candles), 7 cubic feet per lb. of coal is easily obtained.

Fourth.—The gas obtained by this process is remarkably easy of purification, uniform in quality, and very greatly superior to gas obtained by the old process, in its ability to withstand low temperatures without sensible loss in illuminating power.

Fifth.—The cost of making gas by the hydrocarbon process is less than by the ordinary process, very nearly in proportion as the volume of gas obtained is greater. The value of this saving is distinctly set forth in Table II.

Sixth.—The analytical investigations herein given show that the average composition of the hydrocarbon gas varies much less from that of common street gas than has heretofore been assumed.

Seventh.—The heating power of the hydrocarbon gas is found to be greater than that of ordinary illuminating gas; while the water gas* is shown to possess a calorific intensity some nine per cent. greater than that of a good sample of common illuminating gas.

Eighth.—The Gwynne-Harris method is peculiarly applicable to the economical use of very rich cannels or other enriching agents; thus yielding in a given apparatus the greatest possible volume of gas, of a given illuminating power, from a minimum weight of materials.

Ninth.—In entire variance with popular belief, our analyses prove that a compound hydrocarbon gas consumes much less atmospheric oxygen, and vitiates a given volume of air to a much less degree, than an ordinary gas of equal illuminating power.

Tenth.—The correctness of the theoretical notions, which lie at the foundation of the hydrocarbon process, has long been recognized by the most eminent gas engineers; but it is believed that the solution of this important problem has been first successfully achieved by the American system herein described as the Gwynne-Harris process.

* The term "water gas" is used here, and in general throughout this Report, to designate specifically the mixture of hydrogen and carbonic oxide from the anthracite retorts; while the term "hydrocarbon gas" is applied to the perfected product of the hydrocarbon process.

Report on Gas-Purification.

BY PROF. HENRY WURTZ.

[The following document, upon a subject even now of commanding interest, was published privately by the Manhattan Company about six years ago, but has never before appeared in the columns of this Journal. —EDITOR].

To Gen. Chas. Roome, President of the Manhattan Gas-Light Company.

Sir:—In compliance with your wishes, I have the honor to report the results and conclusions arrived at from careful examinations of the methods in use, relatively by your company and by the New York gas company, for the purification of the gas served out to the public.

The history of the art of purification of illuminating gas extends over a period of more than sixty years; but the multitude of processes that have been devised and tested during this long period, at an enormous expenditure of money and labor, have narrowed down in actual practice, on a large working scale, to two in number; and I shall be obliged to confine myself chiefly to these two, in my general discussion of the subject. They are—

First.—The method by moist hydrate of lime; improperly, but universally, designated as the "dry-lime process."

Second.—That by oxide of iron; which, for brevity, I shall speak of as the "iron process."

For about twenty years, the manufacturers of gas have been more or less divided upon the question of the relative merits, the economy, efficiency, reliability and general availability of these two methods. A rare occasion offers here, for a conclusive comparison; in the case of two large urban gas works, among the most extensive, and located in the heart of the most populous city upon this continent; in one of which the iron process, and in the other the lime process, is employed; with what are believed in each case, by the parties respectively interested, to be high and peculiar improvements, of recent introduction.

Those ingredients of the gas which call for the removal (as causing, if left therein, inconvenience or detriment to property or health; or as injurious to the illuminating value) are very many in number, and may be classed as follows, about in the order of their relative importance:

Carbonic acid; chiefly free, but partly, no doubt, as carbonates, of ammonia and other volatile bases.

Hydrosulphuric acid, and hydrosulphates, of ammonia and other bases.

Bisulphide of carbon; with other sulphur compounds not detected by "lead paper;" among which will probably be found the monosulphide of carbon of Persoz, and the recently discovered oxysulphide (CSO) of Than.

Sulphocyanide and cyanide of ammonium, etc.

Sulphuretted substitution products; including probably "compound ammonias," or sulphuretted volatile bases, as yet not studied.

Carbolic and cresylic alcohols.

Butyric, and other volatile acids.

Some of the heavier hydrocarbons; such as amyle, hexyle (capronyle), etc. Acetylene is another hydrocarbon, apparently objectionable on some accounts.

A host of volatile nitrogenous bases, mostly as yet little known; among which are aniline, toluidine, picoline, pyridine, lepidine, chinoline, quinoline, etc., most of which are doubtless objectionable, as being offensive in odor, or poisonous.

Crystalline solids; naphthaline, anthracene, paraffine, pittacal, etc., etc.

To the more important of these deleterious ingredients of the crude gas, and the chemical relations thereto of each the two purifying processes under examination, I shall give a few words each.

Carbonic acid.—Of this contamination, whose chief detriment is enfeeblement of the illuminating power the unpurified gas holds, on an average, about 25 cubic feet in every thousand; and as its density is three times that of the gas, there is at least 7 per cent. by weight of carbonic acid to be got rid of; a quantity greater in amount than all the other impurities (in the gas as it reaches the purifiers) put together. It is to this circumstance, above all, that we are to attribute the high adaptation of hydrate of lime as a purifying agent. Oxide of iron, in the forms employed, is comparatively powerless to remove carbonic acid; and it is, in fact, impossible to perceive how the use of oxide of iron alone can achieve the elimination of much more carbonic acid than that which remains, as carbonates of ammonia, etc., in the "ammoniacal liquor."

Carbonates of ammonia.—The amount of ammonia in the crude gas (though sufficient to affect seriously its illuminating power), being rarely more than two per cent., by volume, and the sulphuretted hydrogen frequently as much as 8 per cent.; considering also the great excess of carbonic acid; there would appear a plausible *a priori* probability that the ammoniacal liquor should retain all the ammonia at least, in combination with one or other of these acids, and particularly in the highly stable and non-volatile form of bicarbonate of ammonia. Facts, however, fail here to sustain hypothesis. In consequence probably of the great volatility of the common sesquicarbonate (*sal volatile*) $2AmO, 3CO^2$; and of the ordinary hydrosulphate of ammonia, AmS,HS; observation shows that these two compounds are largely formed in preference, and are swept on with the torrent of moist gas to the purifiers.

Hydrosulphuric acid and hydrosulphate of ammonia.—The march of the phenomena, in the operation, has been too little investigated, either in the lime process or the iron process, to admit of perfectly reliable theoretical explanations in either case. For the lime process, however, I shall offer the following:

The excess of hydrosulphuric and carbonic acids are of course directly absorbed by the moist hydrate of lime; a quantity of sulphide of calcium being thus formed. This latter takes up the sulphide of ammonium (which is a very unstable compound, and would otherwise break up into gaseous ammonia and hydrosulphuric acid, according to the following equation $NH^4S = NH^3 + HS$), forming a sulphur salt (NH^4S, CaS, of the same type as hydrosulphate of ammonia itself), which doubtless exists, though it has not yet been isolated.

The setting free of ammonia from the carbonate, also, by the action of the lime, is in like manner prevented by the formation of another double salt, a double carbonate of ammonia and lime, which, though also not yet isolated, has been proved to exist, and even to be stable in solution for some time.*

We see, therefore, that in the lime process, the conditions present themselves surely, for the arrest (more or less perfectly, according to the care exercised) of all the free carbonic and hydrosulphuric acids, and their ammonia salts, in definite forms of combination. In the case of the iron process this can by no means be asserted.

Bisulphide of carbon (also called sulphocarbonic acid).—This is the most offensive, probably the most poisonous, and certainly the most troublesome, of all the contaminations to which gas is liable. Besides its repulsive odor, its combustion engenders sulphurous acid gas, whose irritating and morbific action upon the air passages of most persons is a familiar fact. We have shown above that the hydrosulphuric acid of the gas passes in the purifier into the form of sulphide of calcium (CaS), which, as shown long ago by Berzelius (Gmelin; ed. of 1843, vol. 2, p. 200), combines with sulphocarbonic acid to a sulphur-salt of considerable stability.

Sulphocarbonic acid, on the other hand, like carbonic acid, is a contamination over which the iron process must be almost powerless.

The prime importance of freeing gas as completely as possible from sulphur is illustrated by points put in

* A. Vogel (as quoted in Gmelin's Handbuch; Heidelberg Ed. of 1843, vol. 2, p. 242.) "Lime water is not all, or incompletely, precipitated, in the cold, by aqueous ammonia, which is but partially saturated with carbonic acid. The carbonate of lime is first completely thrown down by heat, by two days repose, or by introduction of more carbonic acid gas."

evidence at an inquest recently held in London, upon a supposed victim of the atmosphere of the tunnel of the "Metropolitan (Underground) Railway." Dr. Letheby, in connection with other expert witnesses, testified that one volume of sulphurous acid in 100,000 of air "is strongly perceptible both to taste and smell" and will "create coughing." The familiar use of "brimstone matches" has in fact created an almost universal, though very unfortunate, indifference to this highly morbific gas, sulphurous acid.

Sulphocyanide and cyanide of ammonium.—These are very poisonous, but are doubtless abstracted, with like efficiency, by both processes; their presence in the effete mass being indicated by green colorations in both cases.

Sulphuretted substitution products.—Little or nothing is definitely known of these.*

Carbolic and cresylic alcohols.—(Unusually called acids, by Gmelin classed with aldehydes; but by most chemists of the present day placed with the alcohols, under the names phenol and cresol). Their creosote-like odor renders these objectionable in gas. Under this head I have to say that my hasty investigations of the mode of working of the lime process, as practised by your company, with the peculiar improvements introduced by your engineers, has already led to the discovery of a most remarkable fact, namely, that phenol (or carbolic acid, as it is usually called) is actually condensed from the gas in the lime-purifiers in very important quantity, implying that the usual supposition of the complete passage of the "coal-tar creosotes" into the tar-well is not borne out. The evidence of this fact will appear below. It is the obvious explanation that I wish to present now. This is that the lime arrests them in the form of unstable compounds, analogous to hydrates (salts containing water of crystallization), and alcoholates; decomposed by a slight elevation of temperature. As it cannot be believed that any such result as this can follow in the iron process, it thus appears that the lime process has here another advantage, not heretofore pointed out, in the arrest of these substances; which, however beneficial under peculiar circumstances, cannot be regarded as by any means indispensable or desirable as a compulsory infliction upon consumers of gas.

The nitrogenous bases seem to be mostly deposited in the ammoniacal liquor and the tar; probably in in forms of combination with organic acids.

The same may be said of the volatile solid products; with the marked exception of naphthaline, whose camphor-like property of sublimation at ordinary temperatures, prevents its deposition, in considerable measure; so that much of it reaches the purifiers still in vaporous form. Neither lime nor oxide of iron can be supposed to have any important influence, unless a mere mechanical straining effect, upon this troublesome material; which, though known to be a valuable illuminating ingredient, is far more hurtful than useful; by reason of its tendency to clog the street mains, especially in winter.

It thus appears that of those constituents of crude coal gas which may be viewed as contaminations, and whose separation is desirable, there are no less than four, of the most objectionable, which, while distinctly under the control of the lime process, cannot be shown to be separable by any recognized or reliable chemical or other agency residing in oxide of iron. These four are carbonic acid, ammonia, bisulphide of carbon and phenol.

Since the above was written, I have seen a report recently made to your company by Dr. John Torrey and Carl Schultz, Esq.; on the results of comparative examinations of the gas manufactured by the company over which you preside, and that of the New York gas company; which I am permitted to quote, as in remarkable accordance with the views above expressed.

"Gen. Roome, Pres. Manhattan Gas Light Co.

"Dear Sir—

"The gas of your company, tried on May 18th, at the Irving Place Office, and purified by lime, contained 6·64 grains of sulphur in 100 cubic feet of gas. The gas of the New York Company, tried under precisely the same circumstances on May 19, at their 21st street station, and purified by oxide of iron, contained 12·91 grains of sulphur in 100 cubic feet of gas. The gas of the New York Company contained some carbonic acid and ammonia. The illuminating power did not, however, improve by passing the gas through a lime-purifier.

"May 23d.

Ill'nating power—gas Manhattan Co., = 14·10 candles.
" " " New York Co., = 11·10 "

both being taken at the 21st street station of the New York Gas Company.

"Dated U. S. Assay Office,
New York, June 32d, 1868."

In a note it is stated that the sulphur found was that which remained in the gas in the form of bisulphide of carbon.

REMARKS.

The most striking fact developed by the above short, but significant report, is the high degree of freedom from sulphur of the gas of the Manhattan Company. In contrast with this, the following statement may be quoted from Clegg (last edition, 1866, pp. 196–7): "By none of the processes we have described is the bisulphide of carbon effectually removed, nor has any process yet been discovered by which gas can be purified on a large scale from that compound of sulphur. The Metropolitan gas companies have consequently been unable to comply with the conditions required by the Metropolis Gas Act of 1860, that the gas shall not contain more than 20 grains of sulphur in every 100 cubic feet."

Another most significant point is involved in the fact that, notwithstanding the removal of the residual carbonic acid and ammonia from the gas of the New York Company, by a lime purifier, its illuminating power did not improve. This seemingly anomalous result is in strict accordance with established principles. The supplementary puprification abstracts at the same time, a portion of the hydrocarbon vapors, or light-giving constituents, and thus did the gas as much harm as good. This will receive further attention below.

[To be concluded.]

* Since this was written, investigation has made it probable that these are sulphuretted *alcohols*, or the class of bodies called *mercaptans*.—Ed.

Correspondence.

[Correspondents, in all cases, should sign their communications with their names and address in full—not necessarily for publication, but as a guarantee of good faith.—Ed.

Mr. Hawley's "Disclaimer."

Office Amer. Coal Gas-Light Imp. Co.,
42 Pine St., N. Y., Aug. 8, 1874.

Mr. Editor: The communication from Mr. H. Q. Hawley, President of the People's Gas-Light Co. at Albany, referring to the use of the Gibson Combined Valve and Dip-pipe, patented September 19, 1871, was headed by you in its publication as a "Disclaimer." In this you were mistaken. Mr. Hawley's letter is simply an expression of his unwillingness to admit that the valves had proved to be of general benefit to his company, to the extent shown by the comparison given at Cleveland, viz., by comparing the average yield in dip-pipe seal for the year ending April 30, 1874, with the yield made by use of valves from the date of their application on the works April 22, 1874, to date of statement at Cleveland May 13, 1874, showing a gain in yield of cubic feet per lb. by use of the valves, of more than 9 per cent. For, although the yield with valves from the 22nd to 30th of April 1854. was 11 37-100 per cent greater than the yield in dip-pipe seal from April 1st to 22nd, 1874, and the yield in May, 1874, in valves was 12 per cent greater than the yield in May 1873 in dips, yet, as the reported yield of June and July 1874 does not average much more than that declared for June and July 1873, Mr. Hawley appears to be willing to admit that what is called ordinary working in the retort house, "is no proper test of their efficiency," and wishes to make a fairer trial of their comparative value before appearing to endorse any specified gain as due to their use. This is entirely satisfactory, and will make his future statement of value to those who are waiting for his report of their trial.

When the value of a process, or method of manufacture, is to be determined, I perfectly agree with you, that tests of comparative value can only be made by competent experts: those whose information, as well as general intelligence, will make such observations of value to others. They would require that all the conditions of trial should be made equal, and would give such attention to the details, as would ensure an exact comparison of value.

Such trials have already been made by competent experts, to test the correctness of the general results declared by Gas-light Companies, after many months of continuous use of the valves. Ten tons of coal have been carbonized by use of valves, and compared with eleven tons by use of dips, in same retort house; the yield of gas being greater from the ten tons by valves, than from the eleven tons by dips—and of the many comparative trials made, the general average has fully equalled a gain of 10 per cent. in yield of gas, of equal candle power. Very truly yours,

Wm. H. Grenelle, Special Agent.

The Edgerton Meter.

Trevorton, Northumberland Co., Pa.,
August 10, 1874.

Mr. Editor: Your ecstatic friend "Gasman" evidently labors under the impression that the Edgerton meters possess the talismanic power of making something out of nothing, which less enthusiastic souls consider as a prerogative of the Creator; and he also forgets that wisdom and knowledge, although they may be power, are not *always* happiness.

Or to put the case more plainly. Those meters do not *make* or *enrich* gas, or transform poor gas into good gas; nor do they reduce or ameliorate gas bills. They simply furnish a mode of registration by which the gas consumer may readily tell or ascertain at his pleasure if he is or is not receiving the given amount of light, which the gas company has promised for a given amount of money.

There are very few consumers who know anything about candle power, or consumption per hour for each light; or who, having burned in a month 1175 feet of gas at $3.25 per 1000 cubic feet, know anything about their bill, except that they have been *kept in the dark* on the subject for a month, and then made to pay $3.81. And the average gas consumer don't remember enough arithmetic either to tell how much light a given quantity of gas ought to yield, or how much money it ought to cost. But he can thoroughly understand what his rights are, and if he is receiving them, when supplied with a dollar and cents meter, under a contract to furnish him with *light* at a given rate per hour.

In Shamokin he is told, by the printed contract which constitutes his agreement with the company, that he is to have a light equal to that of a good ordinary gas flame (or 14 standard sperm candles) at a cost of one and a half cents per hour, and whenever he wants to know if his meter is doing him justice he can "time" it as easily as he can a watch. By experience elsewhere (for Shamokin is too late to "be renowned for all time to come, as the first place to recognise and adopt this invention") I am able to say that gas consumers *in practical use* do so "time" their meters both occasionally and continuously, and in many instances are prepared at the close of each month to tell the collector how much they *owe*, instead of swearing at him for telling them how much they *have to pay*. To usher in that "happy day" and "joyful steps," we must also have good gas at a reasonable price.

The credit of introducing these meters, and a patent in connection with their construction, belongs to Henry H. Edgerton, Esq., of Fort Wayne, Ind.

Yours respectfully,
J. D. Patton.

A Correction.

Columbus Gas-Light and Coke Co.,
Columbus, O., August 7, 1874.

Mr. Editor: Your reporter has got the statement that I made in regard to the formation of carbon in retorts (on which I use the patent of G. Douty) terribly mixed. You say this: "I find it quite different from what Mr. McIlhenny states. I find it on the dip (?) in vuite large formations." Now I am positive that I never made that statement, for I *never heard* of such a thing as *carbon* forming on the dip (nor any one else), I think. I did say, however, that I had *some* formation of carbon mostly on the top and back end of the retorts, but only a *small* quantity in comparison to what I found before I commenced to use the patent dip pipes. Yours respectfully,

W. H. Miller, Sup't.
Columbus Gas-Light and Coke Co.

[Original Communication.[

Sunday Labor in Gas Works.

By THEOBALD FORSTALL, General Superintendent of the New Orleans Gas-Light Company.

I have read with much surprise in the JOURNAL of July 16, the objections urged against the cessation of Sunday labor in gas works, by some of the Gas Light Association.

The best proof of the fallacy of these arguments is found in the fact, that in many gas works. both in Great Britain and the United States, no Sunday work is performed. I can assert for one of these institutions, in which it has been my privilege to introduce this principle, that after an experience of its results during fifteen months, there is no desire on the part either of stokers or manager to return to Sunday labor.

The statement that in one gas works in England, the men themselves petitioned for a resumption of labor, proves either that their wages for six days were insufficient to support their families, or that they were so brutalized by their previous treadmill life that they had lost the sense of everything outside of it. In the former case it is a good argument for higher wages; in the latter it supplies the best possible reason in favor of the system which it is brought forward to condemn.

We are solicitous of the condition of a clay retort, and exert much ingenuity to increase its efficiency and lengthen its life, because it is costly to replace; but we exhaust the vital powers of the stoker week after week, leaving him a total wreck in a few years, because he can be replaced without expense. Such, at least, is the only apparent explanation of the general indifference manifested to the improvement of the stoker's lot.

A little reflection will, however, show that although the continuous wear and tear of the stoker's physical constitution, and the consequent depreciation in the quantity and quality of his work, from year to year, does not appear in the "statement of results" as a special factor in the "cost of gas in holders," but is lost in the yield "per ton," or "per retort," it is there nevertheless, and should be eliminated, or reduced to the lowest point. Experience teaches that a man will do more and better work in the six than in the seven days of the week, in the long run; and reasoning merely from this physical stand point, without reference to moral grounds, the human stoker, as a working animal, and, in the interest of his employers, should be made to rest one day every week, as does the horse or ox.

I could give some interesting facts bearing upon this subject from the experience in our retort house; but as Mr. Walker has agreed to read a paper on this question before the next meeting of the association, I am unwilling to forestall him in the points which he will undoubtedly present from his own experience. I may properly. however, mention a few results which may be of interest to him:

1. There is no accumulation of clinker in the furnaces on Monday morning, as asserted. The dampers and ash pans being closed, very little fuel is required to keep up the heats.

2. The three or four men drawn by lot to look after the fires on Sunday, often pay a bonus of one dollar each, besides the wages, to volunteers who will assume the task for the day.

3. Not a single case of drunkenness from Sunday recreation has occurred; and this was the difficulty I had apprehended most before adopting the system.

4. Extraordinary storage room for gas is not essential. In many gas works, in winter, charges are missed on Mondays, because of an accumulation of stock from the smaller consumption of Sunday; and to gas managers who believe in always keeping on a number of retorts, sufficient to render them independent of the weather, the Sunday suspension of make becomes a positive relief.

It remains to be said that the above statements refer to the New Orleans Gas Works, in which Sunday work (from 5 A. M to 5 P. M.) ceased April 20, 1873. The daily production in December last ranged from 1,000,000 to 1,000,100 cubic feet. There was the usual succession of dark days throughout the winter; and the greatest number of retorts under fire during the season, was but ten more than for the corresponding production of the previous winter, while the manufacture proceeded uninterruptedly every day.

Societe Technique de L'Industrie du Gaz en France.

In our issue of June 16, p. 821, vol. xxiii, we gave some particulars referring to an intention to form a gas association under the above title, similar to the British Association of Gas Managers and Engineers in England. Our Paris correspondent informs us that the society held its first meeting on the 23rd of June. The principal object of the meeting was that of settling the rules proposed by the first 84 foundation members. After the election of the committee the following officers were chosen for 1874–5: President, M. A. Mallet; Vice-Presideht, M. Emile Vauthier; Secretaries, MM. Albert Ellison and Edouard Servior; Treasurer, M. Charles Foucart.

The president, in a short address, drew attention to the advantages which the society offered to its members by means of cooperation, exchange of ideas, and the union of interests.

The afternoon was devoted to the discussion of communicated papers. Of course the sitting was chiefly an indication of the future programme of labor. M. Servier, in the name of the committee, enumerated the various questions which would be of most interest to study in the developing of gas manufacture.

M. Ellison and M. Jordan, the president of the "Societe des Ingenieurs Civils," passed in review the various attempts that had been made in England and the United States to replace the labor of workmen by machinery in gas works. They specially named the results which had neen attained by the inventions of Messrs, Somerville and Robinson, and Mr. Foulis, and they urged French engineers to study this interesting problem, especially in regard to the adoption of machinery in the small gas works in France. M. Rouget gave some interesting accounts of the work of his meter, to which we called attention in our issue of June 9, p. 795 *ante*. "The judicious observation of the worthy president of your British Association of Gas Managers, at the late meeting in London, may induce us to enter into further details of M. Rouget's invention, which promises to register exactly the amount consumed, which, as now registered, is generally from 2 to 3 per cent. against the receipts of the gas company from the consumer." After some remarks on MM. Pelouze and Audou n's condenser, gas purification, etc., etc., it was resolved to appeal for the support of the society to all persons engaged in gas manufacture, directly or indirectly, in France. It was resolved also to call an extraordinary meeting next October, to elect new members, in anticipation of the general meeting to be held in May, 1875.—*London Journal of Gas Lighting.*

A Gasometer Crushed.—During the late heavy storm which prevailed on Saturday night, August 6, and which caused considerable damage in and around that city, the large gasometer at Ninth and Diamond streets was crushed in. It was empty at the time. the gas having been drawn off. The tank was of 500,000 cubic feet capacity.—*N. Y. Herald.*

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Cast Iron Gas and Water Pipes—R. D. Wood & Co., Philadelphia Pa..... 10
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Franklin Foundry and Pipe Works—Jas. Marshall & Co., 23 Nineteenth street, Pittsburgh, Pa.. 2
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Middletown Tube and Iron Works—Thos. R. Brown, 25, 27 and 29 North 20th street, Phila., Pa..... 8
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Gas Engineer—B. E. Cholar, 914 Olive St., St. Louis, Mo... 6
Gear Wheels—Scott, 98 Chambers St., N. Y..... 5
Gas-Light Company of America, 63 and 64 Drexel Building, New York..... 2
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Works upon Gas—D. Van Nostrand, 23 Murray street and 27 Warren street, N. Y..... 9
West End Supply Company—Chas. H. Brown, 25, 27 and 29 North 20th street, Phila, Pa..... 8

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(Immediately fronting the Ferry Houses.)

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☞ All communications to be addressed to **"The Proprietors,"** No. 42 Pine Street, Room 18, New York.

MONDAY, AUGUST 17, 1874.

WISHING TO MAKE THIS JOURNAL an organ of intelligent discussion to those of our readers who may wish to gain or give information on the subjects to which its columns are devoted, the publishers solicit letters from all among them who make the study of these subjects a pleasure, or a profession.

Subscribers would confer a favor upon us by remitting *CHECKS*, or *POST OFFICE MONEY ORDERS*, as we are frequent losers where money is enclosed in letters.

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THE LATE CENTENNIAL OF CHEMISTRY.

This memorable celebration took place duly at Northumberland, Pa., as announced, on the 31st of July, and the first of August, the latter having been the actual hundredth anniversary of the first isolation and recognition of the distinctive properties of oxygen gas by Doctor Joseph Priestley.

The following is a list of the gentlemen who officiated on the occasion, as elected by the assembled chemists of America:

President—C. F. Chandler.

Vice Presidents—Rachel L. Bodley, J. W. Draper, Silas H. Douglass, A. H. Gallatin, E. W. Hilgard, E. N. Horsford, J. W. Mallet, S. St. John, H. C. Bolton, A. P. S. Stuart, T. G. Wormley, Henry Wurtz, C. A. Joy.

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Committee on Resolutions—B. Silliman, J. W. Mallet, J. L. Smith, William H. Chandler.

Committee on Scientific Papers—C. A. Joy, T. W. Drown, F. W. Clarke.

Committee on Telegraphy—Frazer, Sharpless and Wheeler.

Colonel David Taggart, of Northumberland, welcomed the Assemblage, in an energetic address. Professor H. W. Croft, of Toronto, Canada, gave an account of the Life and Labors of Joseph Priestley. The following telegrams by Atlantic cable, which explain themselves, were sent and received—

"The brother chemists at the grave of Priestley send greeting to their brother chemists at the unveiling of the statue of Priestley at his home in Birmingham."

BIRMINGHAM, July 31, 1874.

"*To the American Chemists assembled at Northumberland, Pa.*

"Our statue of Dr. Priestley will be unveiled to-morrow at Birmingham, presented by the subscribers through Prof. Huxley, to the town and accepted by the mayor.

"We greet you as colleagues engaged in honoring the memory of a great and good man.

"THE CHEMISTS."

In the course of the ceremonies, most important and memorable addresses were delivered by our two eminent American chemists, Professors Silliman and Sterry Hunt, the former on American contributions to chemistry, the latter on the progress of chemical theory during the century just closed. To these admirable addresses we shall recur again, as we have already Professor Hunt's abstract prepared by himself, and have been promised an advance copy of Professor Silliman's address, which is to be reproduced in full in the *American Chemist*.

As one of the souvenirs of this distinguished historical occasion, we shall put on record the inscription on the tombstone of Priestley, on the banks of the Susquehanna.

To
the memory of the
Reverend Dr. Joseph Priestley,
who departed this life
On the 6th of February, 1804.
Anno Ætatis LXXI.
Return unto thy rest, oh my soul for the
Lord hath dealt bountifully with thee.
I will lay me down in the peace and sleep till
I awake in the morning of the resurrection.

Bountifully, indeed, did the Lord deal with the soul of Priestley. Bountiful also is the spirit to honor his memory, poured out upon his fellow men to-day.

Priestley's name is one which should be especially held in honor by the gas profession. The "pneumatic trough," with its inverted receivers, for collecting gases over water, was his invention, and he was therefore one of the most important founders of gas science. Indeed the industry with which the chemists of one hundred years ago cultivated gas chemistry, or "pneumatic chemistry," as they then called it, is highly worthy of revival and emulation at this day, in which this most important branch of chemistry—pregnant yet with noble future discoveries; for all we know, with such as will rival in importance even the great one of Priestley—is cultivated but by a select few, and neglected altogether by many of the most eminent chemists.

Priestley also discovered several other gases, such as carbonic oxide and laughing gas, and he even experimented, though not to any conclusive extent, with hydrocarbon gases themselves.

One circumstance we regret, connected with the recent occasion; that it was not made, as was intended by many of the most distinguished gentlemen present, the opportunity to form a permanent national society of American chemists. The writer was prevented by professional engagements from being present, and does not therefore know what influences were brought to bear to defeat this movement. Whatever they were, he here puts on record his protest against them, and his deprecation of them.

THE DIP-PIPE SEAL QUESTION.

We consider it right to call especial attention to the communication on another page of W. H. Grenelle, Esq., in vindication of himself against the note of President Hawley of Albany. The heading which we attached to Mr. Hawley's note "Disclaimer," was probably objectionable, and used without much consideration; but certainly no harm has been done. Mr. Grenelle has now his say. It is our intention, so long as this Journal remains in the present hands, to adhere to our principle that its columns are freely open to all, without fear or favor, inside and outside the profession, excluding only inanity, quackery and discourtesy.

We can make no distinction between the two perpetual antagonisms, conservatism and progress; notwithstanding that our own sympathies are with the latter. If these sympathies at any time lead us too far, conservative gentlemen, inside and outside of immediate gas circles, will always find a welcome introduction to our readers. The truth, as tested and established by practical results, is what all should seek, and if in any direction, we have already reached the ultimatum of improvement, nobody wants to know it more than ourselves and our readers.

In regard to this especial question of the abolition of the seal in the main, of course all have read our extracts in our last issue, from Mr. Livesey's address, as President of the British Gas-Managers. A great advance has been made by the advocates of the principle, when such a man goes so far as he does there in virtually admitting the soundness of the principle, and maintains only that it is "very difficult of accomplishment." It does not appear that Mr. Livesey is aware of the results obtained on this side the Atlantic in this direction, by Gibson, Jones, Havens, and McIlhenny. We do not think we err in claiming that our American inventors have already overcome the difficulties of practical accomplishment of which Mr. Livesey complains.

At this stage of this discussion, it may not be useless to give a few words to the subject from a scientific point of view. Certainly any seal, however small, stands directly in the way of the function admitted to be fulfilled by the exhauster, of reducing the tension of compression of the evolving gas in the retort against the hot walls of the latter, proved by Grafton to promote so greatly the dissociation of the richer hydrocarbons of the gas. There is however another point of view. These richer hydrocarbons are, when hot, in a state of unstable molecular equilibrium, particularly liable to be overthrown by *contact* with heated solids. Now at every moment of emission of a bubble of gas from the dip-pipe through the water of the main, a shock must pass through the whole body of gas in the retort. The regurgitating water strikes a blow, as with a hammer, or a piston. Hence certainly increased intestinal disturbance, or incessant *molar* motion in the mass of the gas, bringing fresh surfaces into continual *contact* with the heated walls. In the present state of science, it is also reasonable to believe that a portion of this disturbance will surely be transmuted into *molecular* disturbance, which must conduce to the upsetting of the already tottering equilibrium of the carbon molecules, and assist in the deposition of the incrustation.

We are informed that the parties who have this matter in hand will present further figures soon, of results in other works.

DEPOSITS IN WATER-PIPES.

Coatings on the internal surfaces of pipes used for conveying water have always been troublesome, in all ages, but much more so since the introduction of iron pipes. The injury is twofold in kind, and increases in a sort of geometrical ratio, for not only is the sectional area of the pipe diminished, but by the roughening of the walls and the irregularity of the surface produced, the rapidity of flow is greatly decreased. Hence all engineering calculations are often thrown out, and great loss and inconvenience results. We shall not cite from the great number of cases we have at hand, as on record, of this kind of trouble in the past. What we have particularly now to say, is that of late a new and increasing difficulty has arisen in the case of waters which, like some of our rivers in thickly populated sections, are becoming increasingly loaded with organic matters derived from drainage sources. It is found that acid and probably fatty substances, from the sewage, have the tendency to form nodular and mamillary concretions on the iron, by combination with the oxide of the same.

In the case of a fire which occurred on the 6th of this month at South Boston, great loss of property arose from an utter failure, in the most unexpected manner, of the supply of water for the engines, though the street mains were twelve inches in diameter. The Water Board could not explain it. Now it is known that the organic drainage contamination in the Boston waters has been increasing. Has not this sort of concretions been forming in these pipes?

In one view this subject is of interest to gas men, as producers of tar. We learn that Grahn, an engineer in Krupp's large steel works, at Essen, in Prussia, has investigated the best coating for the interior of cast iron pipes. He comes to the conclusion that rich hydrocarbons, tar, asphalt, pitch, etc., furnish the best coating and, above all, he prefers the artificial "Goudron," the residue from the distillation of tar, to which asphalt has been added. This is not brittle, and is free from carbonate of lime. The difficulty of applying it is also referred to, a kettle of particular form being required for melting it. A machine can be arranged to suspend the pipes in the kettle.

At the Braunschweig water works the dipping in kettles filled with "goudron" has been abandoned, and the material is applied with a brush. When the pipes are dipped in a kettle, the coating is too thick, which makes it comparatively expensive, and the kettle is soon used up.

Pipes lined with this material have been found, after twenty year's constant use, to be in an excellent state of preservation.

OIL-TANKS AND LIGHTNING, AGAIN.

Close on the heels of Weehawken follows Pittsburgh, where, on August 12th, lightning struck oil-tanks in two places on opposite sides of the Allegheny River.

In one case the oil overflowed a space of an acre and a half. Possibly only a hundred thousand dollars worth of oil burnt, and "the men on the premises escaped with difficulty." Therefore no inquiry will be made, no investigation, and no change in arrangement or construction of these lightning traps, the peculiar danger of which we pointed out in a recent editorial. The people of this country will defer examination into this matter no doubt until the coming horror of a city with all its inhabitants enveloped in flames from the explosion of an oil-tank by lightning, or the sudden wafting thereover therefrom, of a square mile or so of flame by a vivid thunder-gust.

On the recent occasion at Weehawken, had there been one of those violent westerly hurricanes that so commonly accompany such thunder-gusts, the contents of the oil-tanks there struck by lightning might have been scattered, in a tempest of fire, all the way across the North River, over the Metropolis.

Absit omen!

THE NATIONAL OIL JOURNAL.

This excellent Monthly, published at Pittsburgh, edited by Messrs. Snead & Rogers, deserves that we should notice its successful efforts to merit the patronage of the public. We find in it a well-selected body of information regarding the oil production, development and trade, besides many other matters of general public and national interest. We urge our readers who desire to be kept well-informed, concerning matters which are well worth knowing, to add it to their list of readables without delay.

AMERICAN WATER-GAS RESEARCHES.

The voluminous report upon these, which has run through so many issues of the Journal, is at last concluded herein. This investigation was far more laborious, extensive, and exhaustive than any other upon a gas subject yet made in this country. It is now on public record, to receive such amount of attention from the profession as may be deemed by the latter its due.

Troy Water Supply.—For a long time past the people of Troy have had under consideration the question of securing an increase of the water supply of that city. Various plans to effect this object have been from time to time proposed, and the Troy *Press* thinks the problem is at last solved by a report from the Hon. Robert M. Hasbrouck, which the *Press* publishes in full. Mr. Hasbrouck, after discussing all previous propositions, finally shows that the best mode of securing the amount of water needed is by the Poestenkill Creek, where at one point in the town of Grafton a dam can be built for $21,000 which will impound an area of 100 acres of water of the average depth of thirty-five feet; half a mile distant another reservoir of 150 acres can be formed, with an average depth of 25 feet, by an expenditure of $25,500; while a quarter of a mile from the last mentioned site is another where, with a depth of 20 feet, 522,720,000 gallons can be stored at a cost of $10,250, making a storage of about three billion gallons of water at a cost of $58,000.

To Cut Glass Jars.—Fill the jar with lard or to where you want to cut the jar; then heat an iron rod or bar to red heat, immerse in the oil; the unequal exposion will check the jar all round at the surface of the oil, add you can lift off the top part.

THE
GAS MANAGERS HAND BOOK,
SECOND EDITION,
Price, $4.
Consists of Tables, Rules, and useful information for Gas Engineers and Superintendents, and all others engaged in the Manufacture and Distribution of
Coal Gas.
By THOMAS NEWBIGGING, A. I. C. E.
For sale by CHARLES NETTLETON,
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NOTICE.
WE WILL SEND, ON APPLICATION FROM ANY GAS-LIGHT COMPANY, a sample
Lime Hurdle,
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GEORGE W. DAY, Treasurer
363-2t Manhattan Lime Hurdle Co., Haverhill, Mass.

ARCHER & PANCOAST MAN'G CO.
DESIGNERS AND MANUFACTURERS OF ARTISTIC

GAS FIXTURES,
AND IMPORTERS OF
FRENCH BRONZES & CRYSTAL CHANDELIERS.
67 Greene Street, } Above Broome,
68, 70, 72 Wooster St. } **New York.**

Steam Fire Engines.—The water space in the boilers of steam fire-engines is very small indeed. This arises from the great number of tubes. These boilers are all constructed with a view to generating steam in the most rapid manner possible. Hence the large fire-service. Now if, from any disarrangement of the pump, the full supply of water is not furnished, the tubes and plates become unprotected, and consequently burned. Iron contorted by burning is greatly weakened, joints are entirely torn from the tube sheets. The pressure used at fires is often from 120 to 150 pounds, and sometimes even higher. Now, if a boiler is weakened by burning, as described above, it is in no condition to withstand such a pressure, and it consequently "lets go," or explodes. The high tension of the steam gives it a different color from that of saturated steam: hence those not familiar with it might say that it appeared like gas. Our own investigations showed conclusively that the boiler was overheated and weakened, and that there was no mystery about the matter.—*Report of J. M. Allen to a Hartford Ins. Company.*

PRICES OF FOREIGN AND DOMESTIC GAS COALS.

[Reported Expressly for this Journal.]

AUGUST 17, 1874.

DELIVERED IN NEW YORK.

English Cannel.

Ince Hall	$17 00	@	18 00
Kirkless Hall	16 50	@	17 00

English Caking Coals.

Newcastle Gas	$12 00	@	00 00
Liverpool caking	11 50	@	12 00

British Province Coals.

Picton			2 50
Block House—At Mines, $2 12, Gold			0 00
Caledonia—At Mines, $2 00, Gold			0 00
Little Glace Bay—At Mines, 1 87½, Gold			2 00
Lingan—At Mines, $2 25, Gold			0 00
Sydney—Old Mine			3 00
" Reserve Mine			2 25
" International			— —

(Duty, 75 cents per ton, gold. Freight to New York $2 25, currency. Cost of above coals delivered in New York, $5 25 @ $6 00½, currency.)

Pennsylvania Coals.

Penn Gas Coal—At Amboy	$7 00	@	0 00
Westmoreland—At Amboy	7 00	@	0 00
(In New York both the above coals $7 50)			
Shafton	7 50	@	0 00
Youghiogheny	7 75	@	0 00

West Virginia Coals.

MurphyRun	$7 40	@	0 00
Despard	7 40	@	0 00
West Fairmont	7 40	@	0 00
American Gas Coal	7 40	@	0 00
Fairmont	7 40	@	0 00
Newburgh Orrel	7 40	@	0 00
Pinnickinick	7 40	@	0 00
Cloverhill of Virginia	6 00	@	6 50
McKenzie Compound Mixture			— —

American Cannel Coals.

Peytona of West Virginia	$12 50	@	00 00
Darlington of Pennsylvania			— —
Cannelton Cannel			12 50
Red Bank—at Philadelphia			7 60
" —at South Amboy			9 00

Asphalts.

Albertite of New Brunswick	$— 00	@	— 00
Ritchie Mineral of West Virginia	18 00	at Balt'e.	
Trinidad Bitumen	— —	@	14 05

The Waverly Coal and Coke Company of Pittsburgh, have contracted with the Pittsburgh Gas-Light Co. for 40,000 tons of their Youghiogheny coal, on private terms.

JAMES MARSHALL & CO.

Franklin Foundry and Pipe Works,

MANUFACTURERS OF

GAS, WATER, AND OIL PIPES,

Works, 18th, 19th, 20th and Railroad Street. Office, No. 23 Nineteenth Street.

Pittsburgh, Pa.

N. B.—Pipe from 3-inch and upwards cast in 12 ft. lengths.

☞ Send for Circular and Price List.

FOR SALE.—TWO IRON TRUSS RETORT HOUSE Roofs, with Ventilators, complete; as good as new. One of them will cover a building 28 feet by about 75 feet; the other 30 feet by 45 feet or 50 feet, all in the clear. For further particulars address F. A. SABBATON,
341-tf Sup't Troy Gas-Light Co., N. Y.

T. DEAN, Pres't. S. F. DEWEY, V. Pres. OFFICE OF H. N. SMITH, Treas. J. M. WARD, Sec.

THE GAS-LIGHT CO. OF AMERICA

Nos. 63 and 64 Drexel Building,

P. O. Box, 5131. NEW YORK.

THE GAS-LIGHT COMPANY OF AMERICA, owners of the Patent Processes for making ILLUMINATING GAS from PETROLEUM and its products, known as the

Gale and Rand Patents,

are prepared to treat with Gas Companies and Manufacturers of Gas for the use of said processes.

An examination of the merits of these inventions as demonstrated by practical experience in a large number of Gas Works employing them, will not fail to convince the intelligent Gas Manufacturer of the great advantages derived from their use.

Gas of unexceptional quality, of high illuminating power is made at many of these works by these processes, at a cost of from 40 per cent. to 60 per cent. less than an ordinary quality of illuminating gas can be made by any other methods in use. Gas Companies generally may easily, and at small outlay for making the necessary changes in manufacturing apparatus, double their net earnings, and supply a much better light to their patrons, at greatly reduced prices.

The Company respectfully refer to Companies using these processes in this city, Brooklyn, Newark, Chicago and elsewhere, and especially to the Mutual Gas-Light Company of Detroit, Mich., whose works more nearly conform in all details of construction to the original plans of the inventors, than those of other Companies.

For correspondence, etc., address to office as above.

JOSEPH M. WARD, Secretary.

GLOUCESTER IRON WORKS.

GLOUCESTER CITY, NEW JERSEY.

DAVID S. BROWN, Pres't. JAMES P. MICHELLON, Sec'y.
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OFFICE, PHILADELPHIA,

No. 6 North Seventh St., (west side.)

CAST IRON GAS AND WATER PIPE

PIPE CAST VERTICAL.

1½ to 48 inches diameter.

Cast Iron Flange Heating and Steam Pipe.

STOP VALVES FOR WATER OR GAS, ALL SIZES.

Fire Hydrants,

GAS HOLDERS,

TELESCOPIC OR SINGLE.

☞ Castings and Wrought Iron Work of all kinds for Gas Works 253-6m

GAS WORKS FOR SALE.

IN A FLOURISHING TOWN ON THE PACIFIC COAST. A rare opportunity for the purchase of a very desirable property.

For particulars address "SUP'T GAS CO." Lock Box 30, Santa Cruz, Santa Cruz Co., Cal. 360-6m

Prof. Henry Wurtz.

Scientific and Practical Chemist and Geologist.

Editor of "The Am. Gas-Light Journal."

PRIVATE OFFICE AND LABORATORY, 12 HUDSON TERRACE, HOBOKEN, N. J.

(First Block from the Ferry.)

Consultations in the city may be arranged by appointment, at the GAS LIGHT JOURNAL Office, 42 Pine street Room 18, or elsewhere. Address to private office.

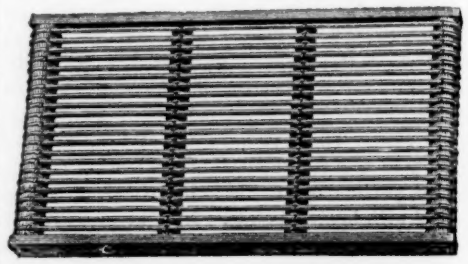
Geological Explorations and Reports upon Coal Lands, and other Mineral Properties—Chemical Analyses—Advice and Investigations in all the Chemical Arts—Chemical Inventions and Improvements made.

Prof. W. makes a specialty of GAS CHEMISTRY, and the Analysis of Gas, Gas and other Coals, and Potable Waters. Has special laboratories and unequalled facilities for these purposes. Formerly Chemical Examiner in the U. S. Patent Office, and peculiarly competent as an

Expert in Patent Cases.

THE MANHATTAN

LIME HURDLES.



The most satisfactory results ever produced by any device used for supporting slaked lime, for the purpose of purifying coal gas.

6,800 CU. FT. OF GAS PURIFIED PER BUSHEL OF LIME.

These Hurdles combine, as no other device has, *Extreme Porosity*, with lightness, strength, and durability.

Their *entire cost will be saved* in one season's use in preventing carbon accumulations in the retorts, and in allowing the *entire* body of lime to be of service.

Gas Light Companies before ordering elsewhere will find it for their interests to give these Lime Hurdles, or supports, their consideration, and a trial will substantiate the above.

We shall deliver for six months, these Lime Hurdles, or supports, to most any point in the United States, free of Freight charges.

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LIME HURDLE CO.

HAVERHILL, MASS.

GEORGE W. DAY Treasurer, Office No. 3 Railroad Square

NEW YORK STEAM ENGINE CO. MANUFACTURERS OF MACHINISTS TOOLS OF EVERY DESCRIPTION

Having added a

SCOTT'S GEAR MOULDING MACHINE

To our Foundry, we are now prepared to furnish,

WITHOUT CHARGE FOR PATTERNS,

GEAR-WHEELS

OF ALL DESCRIPTIONS,

AT THE

SHORTEST NOTICE.

Work warranted perfectly accurate. Send for circular giving price, and directions for ordering.

N. Y. Steam Engine Co.,
98 Chambers St.,
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98 CHAMBERS ST. N. Y.

P. P. DEILY, J. FOWLER.

1842. *1874.*

DEILY & FOWLER,

39 LAUREL STREET, PHILADELPHIA, PA.,

Builders of Gas Works.

MANUFACTURERS OF

GAS-HOLDERS,

Single and Telescopic.

WROUGHT IRON ROOF FRAMES,

COAL WAGONS,

COKE BARROWS,

AND ALL

Wrought Iron Work

CONNECTED WITH GAS WORKS.

☞ Particular attention paid to Extensions and Repairs.

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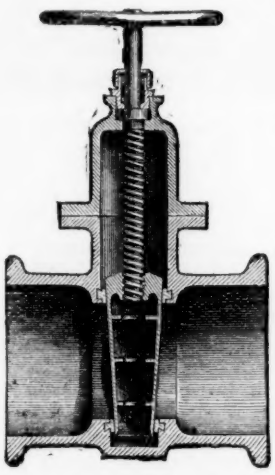
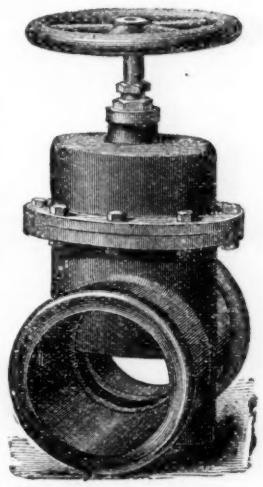
MANUFACTURERS OF

CHAPMAN GAS VALVES.

Office and Sales Room 75 and 77 Kilby Street, Boston.





These Valves have been in use for several years, and are pronounced by all who have used them to be

The Best Gas Valves Ever Made.

They afford a direct passage the full size of the pipe. The seats are made of an alloy similar to BABBITT metal, specially prepared for the purpose, and superior to all other metals used for the seats of Gas Valves. It does not corrode under any circumstances to which it is exposed.

There is no LIABILITY OF COHESION between the Gate and Seat, and the Valves can be relied upon to SHUT TIGHE and OPEN EASILY at all times—an important desideratum when used for street mains, in cases of fire.

We refer to the following named Gas-Light Companies among the many that have used these Valves:

BOSTON GAS-LIGHT COMPANY, BOSTON, MASS.
CAMBRIDGE GAS-LIGHT COMPANY, CAMBRIDGE, MASS.
NEWTON & WATERTOWN GAS-LIGHT CO., WATERTOWN, MASS.
LAWRENCE GAS-LIGHT COMPANY, LAWRENCE, MASS.
PEOPLES GAS-LIGHT COMPANY, BROOKLYN, N. Y.
CITIZENS GAS-LIGHT COMPANY, BROOKLYN, N. Y.
SOUTH BOSTON GAS-LIGHT COMPANY, BOSTON, MASS.
CHARLESTOWN GAS-LIGHT CO., CHARLESTOWN, MASS.
LYNN GAS-LIGHT COMPANY, LYNN, MASS.
FITCHBURG GAS-LIGHT COMPANY, FITCHBURG, MASS.
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WILLIAMSBURGH GAS-LIGHT CO., WIRLIAMSBURGH, N. Y

GAS AND WATER VALVES ½ INCH TO 36 INCHES DIAMETER.
STEAM VALVES ½ INCH TO 12 INCHES DIAMETER.
357-tf

CANNELTON COAL COMPANY

Of West Virginia,

Offer to Manufacturers of Gas the pure Cannel Coal from their Colliery at Cannelton, West Virginia. This coal after having been thoroughly tried by the most expert and reliable Engineers, has shown itself to be the most valuable **Enriching agent** produced in this country—a gross ton yielding **10,000** cubic feet of gas, of **64.54** candle power, to purify which, required only two bushels of lime. The yield of coke is **32 bushels** of good quality, quite light, burns freely, making a very hot fire. For further information address

J. TATNALL LEA, Treas.,
P. O. Box 1747. No. 325 Chestnut Street, Phil'a.

PEYTONA CANNEL COAL

From West Virginia.

Yields over **13,000** feet of Gas per ton. At ten thousand feet (standard yield) the illuminating power is over **43** candles. Purifies **4,510** feet to the bushel of lime.

S. E. LOW, Secretary,
354 Office, 58 Broadway.

MASSACHUSETTS INSTITUTE OF TECHNOLOGY.

Entrance Examinations June 1 and 2, and Sept 23 and 24.
For new Catalogue and late Entrance Examination Papers apply to PROF. SAMUEL KNEELAND,
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Steam & Gas Pipe Co.,

PROVIDENCE, R. I.,

BUILDERS OF

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RETORT HOUSE ROOFS,
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Particular attention given to

Enlarging and Rebuilding Gas Works.

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CAST IRON PIPES,

FOR WATER AND GAS,

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GAS WORKS AND MACHINERY CASTINGS

OF EVERY DESCRIPTION,

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AMERICAN

GAS WORKS

CONSTRUCTION

AND

Supply Company.

Presldent--JAMES A. TAYLOR, Columbian Iro Works.

Engineer—A. F. HAVENS, late of Brooklyn Ca Light Co, Patentee of the following inventions:

HOISTING ENGINES,
COAL ELEVATORS,
WIRE-ROPE RAILROAD,
TRAYS FOR LIME OR IRON
RETORT CHARGING AND RAKING MACHINE,
RETORT SETTINGS,
SELF-SEALING LIDS,
AUTOMATIC DIP-PIPE SEAL
SECTIONAL PURIFIERS.

The above Patents are the result of many years experien and are of great value, enabling any Company to incr the capacity of its Retort and Purifying Apparatus 15 to per cent without change, and at slight cost.

Plans, Specifications, and Details furnished of all Appar tus, and Companies supplied with every thing required in Gas Manufactura, from the greatest to the least, at the lo est market rates.

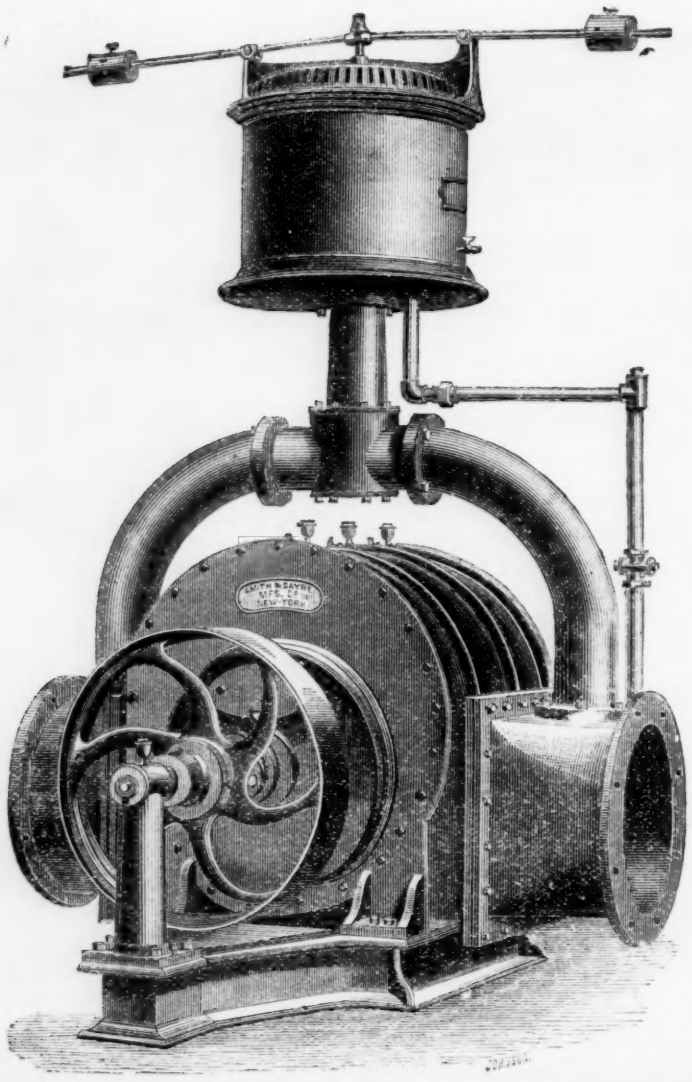
American Gas Works Construction and Supply Company,
No. 34 Dey St., N. Y.

☞ Mr. HAVENS can be consulted on all matters appertaining to Gas and its manufacture, gratis.

SMITH & SAYRE MANUFACTURING COMPANY.

The Mackenzie Patent Gas Exhauster

And Patent Compensator.



They are made to pass from 4,000 to 150,000 cubic feet of gas per hour; will increase the production and illuminating power of the gas, and add very much to the durability of the retorts, etc. The Compensator obviates entirely the necessity of water-joints, compact, durable, cleanly, not liable to get out of order, self-acting, quiet, and certain in its operation.

MACKENZIE PATENT BLOWER, PATENT CUPOLA AND SMELTING FURNACE.

The Blower is a Force Blast machine, durably built, and can be driven with one-third the power required to drive the ordinary Fan. The Cupolas are manufactured in sizes to melt from 1 to 40 tons per hour, will save one quarter of the time required by the old style Cupola, and 33 per cent fuel. Address

CHARLES W. ISBELL, Secretary. JAMES M. SAYRE, Treasurer.

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AMERICAN

GAS SCREEN MAN'F'G COMPANY.

TO GAS-LIGHT COMPANIES.

Your attention is respectfully called to the GAS SCREEN now being manufactured by the American Gas Screen Manufacturing Company, under the patents granted to E. DUFFEE, and are pleased to submit the following points of their excellence and superiority over all other screens now in use.

The Screen is made with an oak frame, interlaced with split rattan, drawn through holes at regular intervals in the Frame and cross-pieces, the edges of the frame being grooved to prevent abrasion.

The advantages of the screen are:

1st. The large purifying surface, the construction of the Screen giving over three-fourths of the surface for the gas to penetrate the lime.

2d. On account of the free passage of the gas through the screen the pressure is reduced, thereby preventing the accumulating of carbon on the retorts.

3d. The saving of lime and labor, as the Screens are not liable to clog, and are easily cleaned.

4th. Their cheapness and simplicity of construction.

5th. Their DURABILITY—they can be used longer than any other now used.

Testimonials.

PROVIDENCE, RHODE ISLAND, March 21st, 1872

E. DUFFEE, Esq., Agent, etc.

Dear Sir: The Trays manufactured by you for our West Station were put in use in September last, and have *given perfect satisfaction.*

The frames are well put together, and I see no reason why they will not last for a long time. The *very large amount of* open space in these Trays gives the gas an easy passage, and brings it into contact with the lime much better than when the space is so contracted, as is the case in most of the other Trays in use.

The pressure thrown upon the retorts by contracted passages is very great, and were gauges used more frequently than they now are in many gas-works, this facat of having *open Trays* would become more apparent to mangers of gas works. The digerence in pressure at this station in passing the gas through your purifiers, is two-tenths (2-10) inches.

The amount of gas purified. per bushel of lime used to this date, is six thousand five hundred and fifty six (6,556) cubic feet.

Respectfully yours,
JAMES H. ARMINGTON, Supt.

BOSTON GAS-LIGHT CO., Dec. 1871.

Dear Sir: In answer to your inquiry how we like your Patent Tray for dry gas purifiers, I take pleasure in saying we have used them exclusive of all others, for the last three years, and think them far ahead of any yet offered. The surface being nearly three times that of any other Tray, and their lightness and durability perfectly satisfactory.

Yours respedtfully,
A. M. GILES.

EDWARD DUFFEE, Esq.

EAST BOSTON, JUNE 15, 1871.

Gentlemen: We have used your Screens some five years. They give perfect satisfaction.

I consider them *by far the best Screen* for Dry Lime Purifiers I have seen. Yours truly, A. M. NORTON, Supt.

CHELSEA, May 1, 1871.

Mr. E. DUFFEE.

We are using your Purifying Trays, and find them to be the *best of any* that I have used, and will *purify more gas with less pressure* than any tray that I know. I can fully recommend them, after four years trial, to any Gas Superintendent with perfect safety, as the *cheapest and best Tray made.*

Yours truly, JOHN ANDREW, Sup't.

DORCHESTER, March 3. 1870.

Mr. E. DUFFEE.

Dear Sir: We have had your Gas Trays in constant use for almost one year and six months and find them superior to any others we have ever used, both in point of economy and efficiency. Truly yours, W. B. BROOKS,
Agent Dorchester Gas-Light Co.

JAMAICA PLAINS, MASS., June 21, 1871.

EDWARD DUFFEE, ESQ.

Dear Sir; The Trays ordered by this company three years ago, are getting somewhat worn. I wish to say here that I consider your Trays to be superior to any yet invented, therefore please make us another set at the price named, to be like the sample shown in every way, and oblige Yours truly
JAMES F. ROGERS,
Sup't Jamaica Plains Gas-Light Co.

BROOKLINE, June 11, 1871.

E. DUFFEE, ESQ.

Dear Sir: You will please make a set of Gas Trays for this company as soon as convenient, at price named. In regard to the merits of the Tray, after having them in constant use for over two years, I will say that I consider them *superior to any Tray* manufactured in this country. Respectfully yours,
H. A. ALLYN,
Sup't Brookline Gas-Light Co.

BANGOR, August 2, 1870

EDWARD DUFFEE, ESQ.

Dear Sir: Yours of the 20th ult. is received. In regard to your Gas Trays, I take pleasure in saying that they have been in use over two years, and have given perfect satisfaction and they are in good order at the present time; should have no hesitation in recommending them, believing they are the most durable and easiest kept in order of any with which I am acquainted. Respectfully yours,
W. H. PERRY, Sup't.

OFFICE OF THE SPRINGFIELD GAS-LIGET CO.
SPRINGFIELD, MASS., Oct. 10, 1871.

Mr. WARD,
President Hartford Gas-Light Co.

Dear Sir: I have been using Gas Screens made by the American Gas Screen Company, for nearly a year, and find them superior in every way to the wooden Screens made and formerly used by the Springfield Gas-Light Co. I can purify more gas with the same quantity of lime, there being more surface to the Screens; and I consider them more durable, and recommend them to your consideration.

Yours with great respect,
GEORGE DWIGHT

ROXBURY, June 14, 1872.

EDW. DUFFEE, ESQ.

Dear Sir: In answer to your inquiry regarding your Patent Gas Screens, I am happy to be able to say, that after nearly three years constant use we are perfectly satisfied with them being able to purify over fifty pet cent. more gas with them than with any other Screen we have used.

Yours respectfully,
THOMAS J. PIERCE

OFFICE DETROIT GAS-LIGHT CO.,
DETROIT, MICH., April 22, 1872.

AMERICAN GAS SCREEN MANUFACTURING CO., HAVERHILL.

Gentlemen: The Screens bought of you work far better than any we have ever used. As a proof, we have with the same quantity of lime purified *twenty per cent.* more gas with your Screens than with any others, and the work well done. The workmen are also better pleased with them—they being light and handy to work. They also relieve the pressure very much upon the retorts, and I cheerfully give you my experience.

Yours truly,
P. E. DEMILL, Secretary.

We give a list of some Gas-Light Companies using them.

Providence, R. I. Gas-Light Co., Boston, Mass. Gas-Light Co.: East Boston, Mass., Gas-Light Co.; South Boston, Mass. Gas-Light Co.; Springfield, Mass., Gas-Light Co.; New Bedford, Mass., Gas-Light Co.; Manchester, N. H., Gas-Light Co.; Reading, Penn., Gas-Light Co.; Biddeford, Me., Gas-Light Co.; Hartford, Conn., Gas-Light Co.: New Haven, Conn., Gas-Light Co.; New Orleans, La., Gas-Light Co.; Savannah, Ga., Gas-Light Co.; Charleston, S. C., Gas-Light Co.; Trenton, N. J., Gas-Light Co.; Charlestown, Mass., Gas-Light Co.; Dorchester, Mass., Gas-Light Co.; Chelsea, Mass., Gas-Light Co.; Baltimore, Md., Gas-Light Co.; Manhattan, N. Y., Gas-Light Co.; Cincinnati, Ohio.; Gas-Light Co.: San Francisco, Cal., Gas-Light Co.; Albany, N. Y., Gas-Light Co.; Sacramento, Cal.; St. Joseph, Mo., Gas-Light Co.; Leavenworth, Kansas, Gas-Light Co.; Macon, Ga., Gas-Light Co.; Roxbury, Mass., Gas-Light Co.; Lansinghburg, N. Y., Gas-Light Co.; Bridgeport, Conn., Gas-Light Co.; Stamford, Conn., Gas-Light Co.; Poughkeepsie, N. Y., Gss-Light Co; Scranton, Penn., Gas-Light Co.; Lewiston, Me., Gas-Light.Co., and one hundred others.

Address **R. A. POTTER, Treas.,**
Amer. Gas Screen Man'f'g Co., Haverhill, Mass.
EDWARD DUFFEE, Agent.

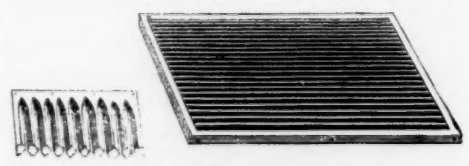
J. L. CHEESMAN.

MANUFACTURER OF

Patent Conically and Diamond Slotted

SOLID WOOD TRAYS.

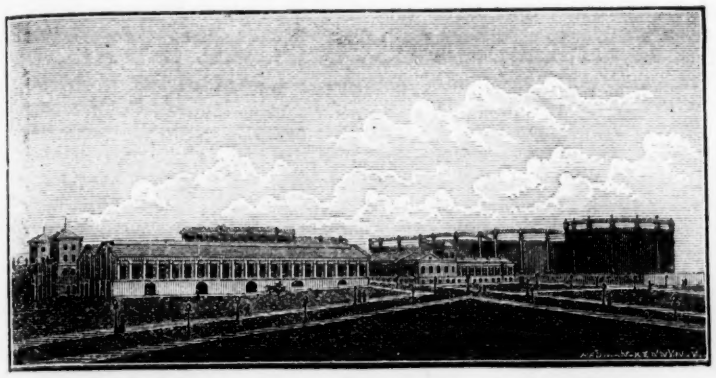
PATENTED OCTOBER 21, 1862 AND JUNE 10, 1873.



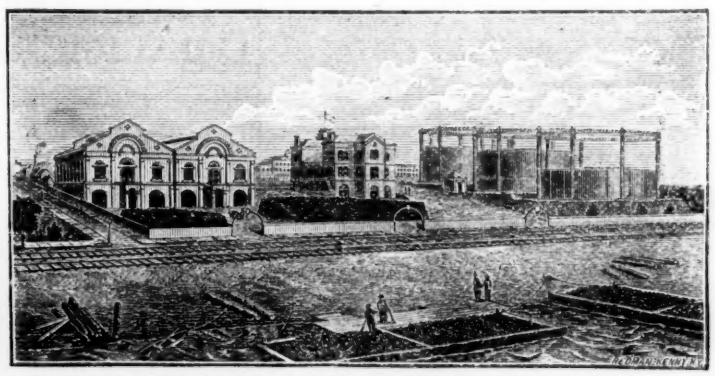
To Gas Companies.

The above Trays will last longer. and are cheaper than any Tray now used. They are now made without any outside strips, which gives more purifying surface, being perfectly smooth. The lime will not adhere to them as in other Trays. They are now used in over three hundred Gas Companies in the United States, and other places.

JOHN L. CHEESMAN,
151 and 153 Avenue C, New York.



CINCINNATI GAS-WORKS, ERECTED 1871-72-73.—WM. FARMER, ENG.



LACLEDE GAS WORKS, ERECTED 1872.—WM. FARMER, ENG.

WILLIAM FARMER,

ARCHITECT AND GENERAL GAS ENGINEER,

111 BROADWAY, TRINITY BUILDING, Room 95, New York.

WILLIAM FARMER may be consulted upon all matters connected with the construction of GAS WORKS, or any other description of buildings. Will furnish General and Detail Drawings, Specifications and Estimates for Gas Works of any capacity.

PATENTEE OF THE FOLLOWING INVENTIONS:

Exhausters for Gas and Foul Lime Ventilation,
Dumping Barrows for Coal, Coke and Lime,
Hydraulic Mains for Retort Benches,
Blowers for Forges, Foundries, &c.
Pumps for Water, &c., &c.

REFERENCES:

Professor SILLIMAN, New Haven, Conn.
GEN. CHAS. ROOME, President Manhattan Gas-Light Company, N. Y.
A. W. BENSON, President Brooklyn Gas-Light Company, Brooklyn, N. Y.
W. W. SCARBOROUGH, President Cincinnati Gas-Light Company, Cincinnati, Ohio.
S. L. HUSTED, President Laclede Gas-Light Company, St. Louis, Mo.
Prof. HENRY WURTZ, Editor AMERICAN GAS-LIGHT JOURNAL, N. Y.
GEN. A. HICKENLOOPER, Vice-President Cincinnati Gas-Light Co., Cincinnati, Ohio
FREDERICK CROMWELL, Vice-President Laclede Gas-Light Company, St. Louis Mo.
C. VANDERVOORT SMITH, Engineer Manhattan Gas-Light Company, N. Y.
JAMES R. SMEDBERG, Consulting Engineer, San Francisco Gas-Light Co., Cal. [342

GAS PURIFICATION.

St. John and Cartwright's
NEW IRON COMPOSITION

Has purified, per bushel, on a single test, 10,000 feet of Westmoreland Gas. With revivification lasts indefinitely. Surpasses in POWER and ECONOMY all known materials. Saves largely in FIRST COST, SPACE, LABOR, SUPERINTENDENCE, and all current expenses. Will purify *easily* sulphurous gas, wholly *unmanageable by lime*. Takes out *all the ammonia*. Now operating in the following Gas Works: Harlem, New York (21st street); Port Morris; Hunter's Point; East New York Worcester, Lynn and Cambridge, Mass.; Lewiston, Maine; St, Albans, Vt.; Pawtucket, R. I.; Meriden, Ct.; and being introduced in many other places.

Cost 70 cents per bushel. One bushel for each square foot of Purifier sufficient. Rights to use for life of Patents, for daily makes of gas in thousands; under 25,000 $200; under 50,000, $400; under 100,000, $500; $250 additional for each additional 50,000 per day.

For further information and instructions, apply to
ST. JOHN & CARTWRIGHT,
21st Street and Avenue A, New York Gas Works.

☞ Immediate arrangements are urged, as the demand for the prepared composition is increasing *so rapidly* that delays in supply may occur.

B. S, BENSON.

MANUFACTURER OF

Cast Iron Pipes and Fittings,

AND

Cas and Water Mains.

All sizes from 3 to 30 inch cast vertically in 12½ feet lengths

Office & Factory 52 East Monument St.,
BALTIMORE, MD.

OHIO GAS CANNEL,
From the Sterling Colliery.

We are now prepared to place in the market, through our agents as below, a regular and unlimited supply of this valuable Cannel, for gas purposes. The analysis made in 1871 by Prof. WURTZ, Editor of this Journal, at the Laboratories of the NEW YORK GAS-LIGHT COMPANY, gave 47½ per cent of Volatile Matter and 45 bushels to the ton of a fair quality of coke. The yield of gas was at the rate of 9,500 feet per ton of about 27 candle power. It is not highly sulphurous, can be purified by Lime, and the ash from the coke does not clinker. The above test has been fully substantiated as correct, and can confidently recommend trial of the coal.

TUTTLE & GIRTY Proprietors,
Cleveland, Ohio.

GENERAL AGENTS.

Geo. Merryweather, 52 William St., (Corner Pine) N. Y. Post Office Box, 5415.

GEO. STACEY. HENRY RANSHAW. WM. STACEY.

GEO. STACEY & CO.,

MANUFACTURERS OF SINGLE AND TELESCOPIC

GAS-HOLDERS,

AND ALL KINDS OF

Cast and Wrought Iron Work

Used in the Erection of Gas and Coal Oil Works.

Foundry on MILL STREET; Nos. 33, 35, 37 and 39.
Office and Wrought Iron Works on RAMSAY STREET Cincinnati, Ohio.

REFERENCE.

Cincinnati Gas-Light Co.
Indianapolis Gas Co.
Dayton, O., Gaslight Co.
Covington, Ky., Gas Co.
Springfield, O., Gas Co.
Terre Haute, Ind., Gas Co.
Madison, Ind., Gas Co.
Kansas City, Mo., Gas Co.
Topeka, Kansas, Gas Co.
Burlington, Iowa, Gas Co.
Nashville, Tenn., Gas Co.
Baton Rouge, La., Gas Co.
Saginaw, Mich., Gas Co.
Oshkosh, Wis., Gas Co.
Peoria, Ill., Gas Co.
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Carlinville, Ill., Gas Co.
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Hamilton, Ohio, Gas Co.
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Denver City, Cal., Gas Co.
R. T. Coverdale, Eng'r Cincinnati, and others.

JESSE W STARR & SONS,

Camden Iron Works

Camden, New Jersey,

MANUFACTURERS OF

ALL KINDS OF CASTINGS AND APPARATUS FOR GAS WORKS,

Wrought Iron Roof Frames,

For Retort and other houses Retorts and all castings required for setting them in the latest and most improve model. WASHERS, CONDENSERS, SCRUBBERS and EXHAUSTERS for relieving the Retorts from pressure. PURIFIERS, varyin from 2,000 to 2,000,000 cubic feet daily purifying capacity.

Wrought Iron Lime Sieves

for Purifiers. Station Meters of all sizes.

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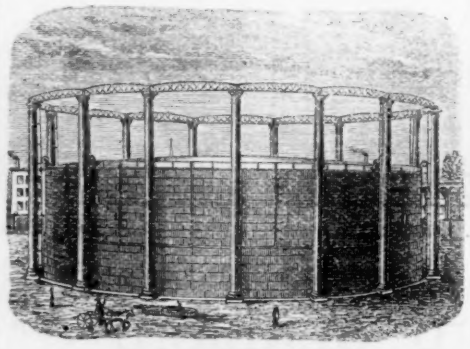

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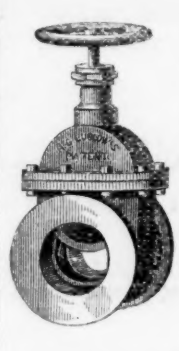

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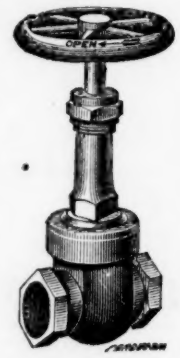

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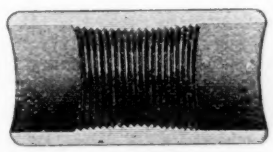

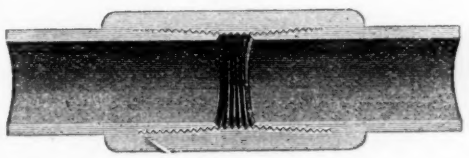

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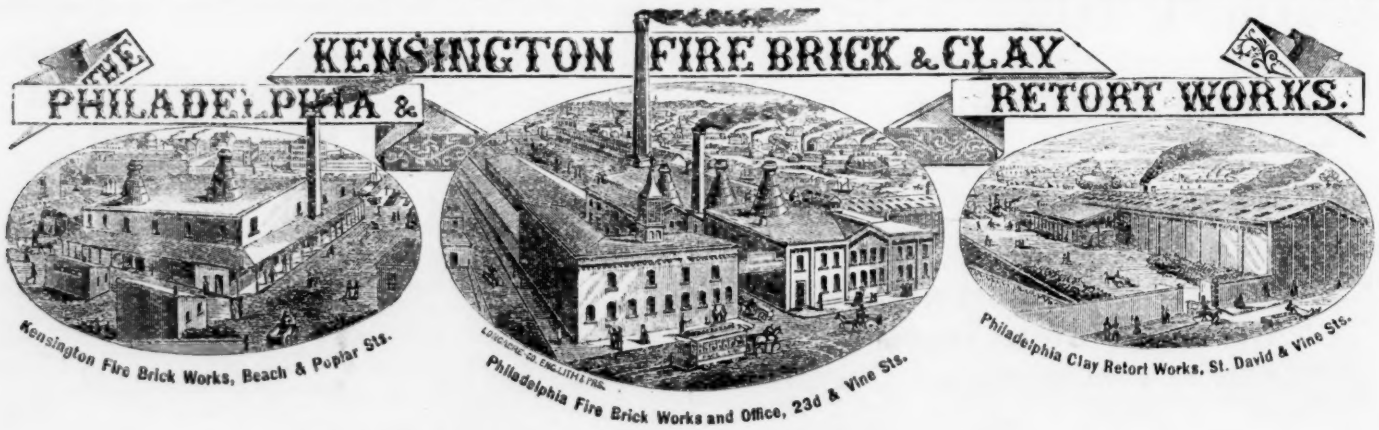
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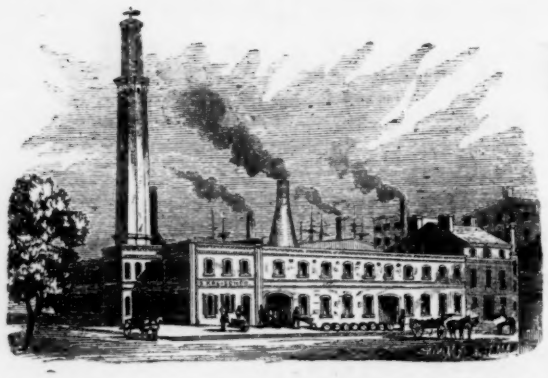

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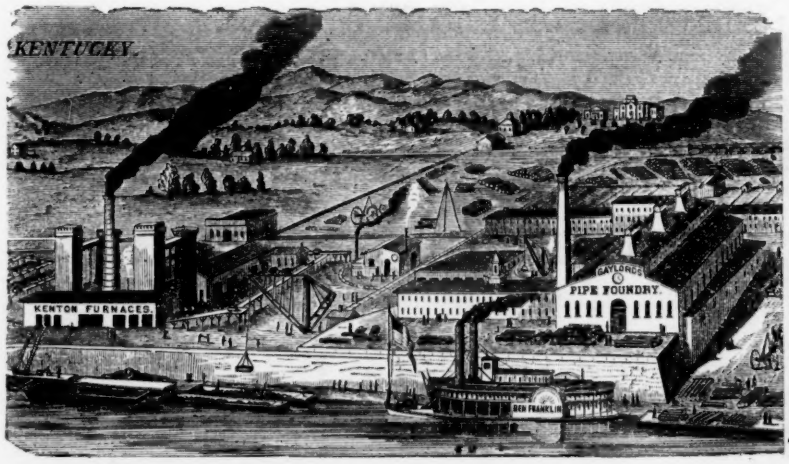

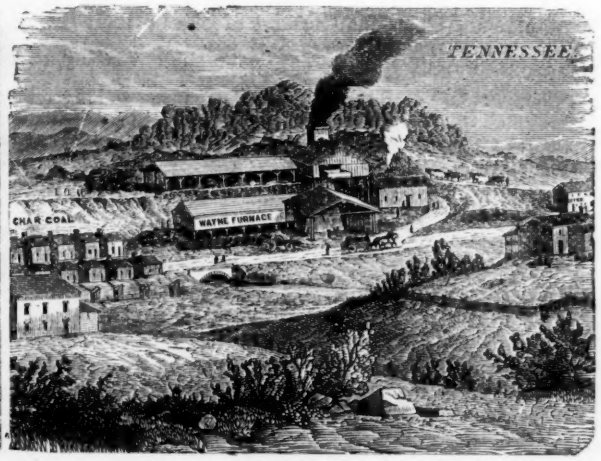

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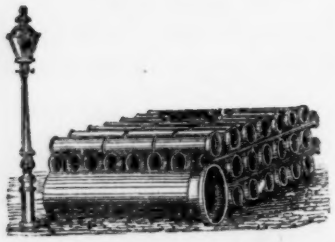

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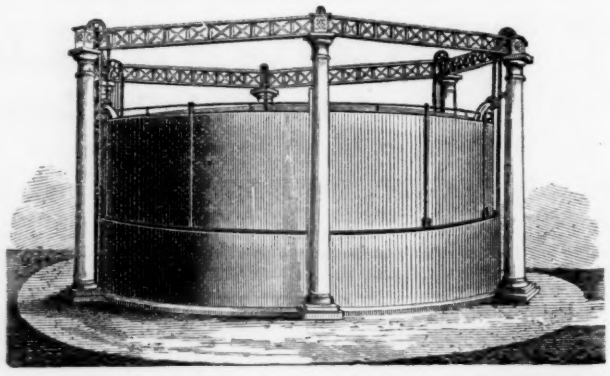

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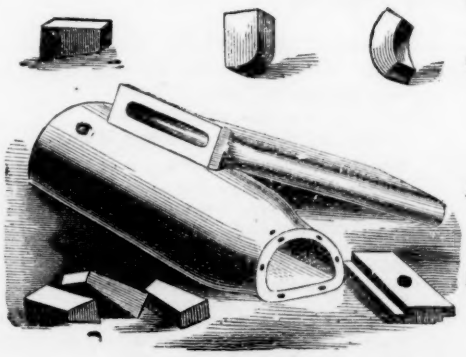

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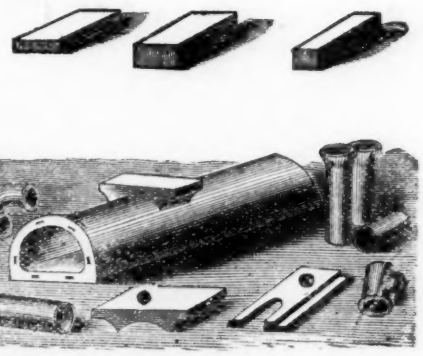

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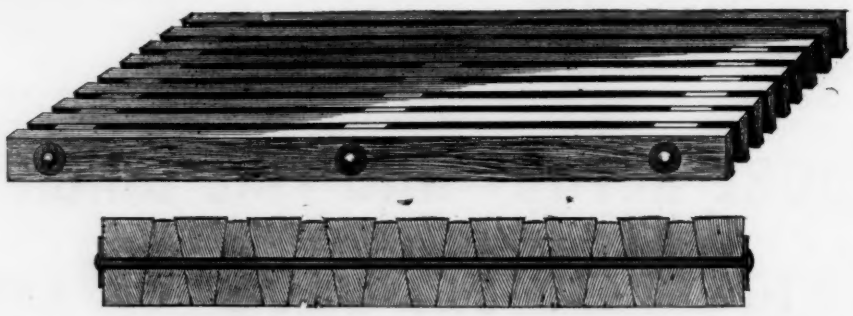

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